QUARTERLY JOURNAL

OF

THE METEOROLOGICAL SOCIETY.

EDITED BY

A COMMITTEE OF THE COUNCIL.

VOL. II.

LONDON:
WILLIAMS AND STRAHAN, 7 LAWRENCE LANE, CHEAPSIDE, E.C.
1875.

PRINTED BY WILLIAMS AND STRAHAN,
7 LAWRENCE LANE, CHEAPSIDE, E.C.

TABLE OF CONTENTS.

LIST OF PLATES.

ERRATA.

Page 52, line 15 from bottom, *for* " a chief rain period from the beginning of August " *read* " a chief rain period from May to the beginning of August."

Page 113, second line from bottom, *after the words* "metres per second" *insert* " should be given."

Page 125, last line, *for* 100 : 666 : : 133 *read* 100 : 666 : : 1333.

THE METEOROLOGICAL SOCIETY.

ESTABLISHED APRIL 3RD, 1850.

INCORPORATED BY ROYAL CHARTER, JANUARY 27TH, 1866.

LIST OF FELLOWS.

JANUARY 31ST, 1873.

An asterisk opposite to a name indicates a Life Fellow.

1869. Feb. 17. Abercromby, The Hon. Ralph. 21 *Chapel Street, Belgrave Square*, S.W.
1867. Jan. 16. Adam, A. Mercer, M.D. *Bargate Lodge, Boston, Lincolnshire.*
1862. Nov. 19. Adley, Charles Coles, Assoc.Inst.C.E. *Nerbudda Coal and Iron Co. Works, near Garrawarra, C. P., India.*
1850. Aug. 7. Aird, John. *Belmont Hill, Lee, Kent*, S.E.
1862. Mar. 19. Airy, Sir George Biddell, K.C.B., M.A., LL.D., D.C.L., Astronomer Royal, F.R.S., F.R.A.S., Hon. Mem. R.S.E., R.I.A., &c. *The Royal Observatory, Greenwich*, S.E.
1864. June 15. Andrews, William. 16 *Telegraph Street*, E.C.
1870. Apr. 20. Armitstead, Rev. T. B., B.A. *The Parsonage, Garstang, Lancashire.*
1857. Mar. 24. Armstrong, Sir William George, K.C.B., LL.D., F.R.S., M.Inst.C.E. 8 *Great George Street*, S.W.; *and Newcastle-upon-Tyne.*
1858. Jan. 20. Arnold, John. *Army Hospital Corps, Aldershot Camp, Hants.*
1850. May 7.*Atkinson, George Clayton. *Wylam Hall, Northumberland.*

1859. Nov. 16. Balme, Edward Balme Wheatley. *Loughrigg, Ambleside.*
1871. Apr. 19. Barber, Samuel. *The Lyceum; and Riversdale Road, Aigburth, Liverpool.*
1862. June 18.*Barclay, Henry Ford. *Monkhams, Woodford*, N.E.
1862. Mar. 19.*Barclay, Joseph Gurney, F.R.A.S. 54 *Lombard Street*, E.C.; *and Knott's Green, Leyton, Essex*, N.E.
1864. June 15. Barham, Charles, M.D. *Truro, Cornwall.*

1866. Nov. 21.*Barker, Samuel, M.D., L.R.C.P. Edin., M.R.C.S., F.R.M.S. 14 *Eaton Place, Brighton, Sussex.*
1864. June 15.*Barnes, R. H., B.A., F.L.S.
1852. Mar. 2.*Barrow, Benjamin, M.R.C.S. *Ryde. Isle of Wight.*
1864. Mar. 16. Beattie, Alexander. *Summerhill, Chislehurst.*
1863. Jan. 21. Bell, Isaac Lowthian, Assoc.Inst.C.E. *The Hall, Washington, Durham.*
1865. Nov. 15. Beverly, Rev. Alexander, M.A. *Seafield Cottage, Rubislaw, Aberdeen.*
1853. Nov. 22. Bewick, Thomas John, M.Inst.C.E. *Haydon Bridge, Northumberland.*
1867. Mar. 20. Bickerton, Alexander William. *Oak House, Bellevue Road, Southampton.*
1869. Jan. 20. Bicknell, Percy. *Foxgrove, Beckenham,* S.E.
1863. Mar. 18. Billson, Henry. 8 *Belmont Villas, New Walk, Leicester.*
1872. Feb. 21. Birt, William Radcliff, F.R.A.S. *Cynthia Villa, Walthamstow, Essex.*
1851. Feb. 11. Bloxam, John Charlton, M.R.C.S. *Thorncliffe, Niton, Isle of Wight.*
1864. Nov. 16. Bolton, Major F. J., late 12th Regiment. 2 *Westminster Chambers, Victoria Street,* S.W.; *Junior Naval and Military Club,* 19 *Dover Street,* W.; *and Junior United Service Club, Charles Street, St. James's,* S.W.
1862. June 18. Bosanquet, James Whatman, F.R.A.S. 73 *Lombard Street,* E.C.; *and Claysmore, Enfield,* N.
1864. June 15.*Bouverie, The Right Hon. Edward P., M.A., M.P., F.R.S., F.R.M.S. *Manor House, Market Lavington, Wilts.*
1857. Mar. 24.*Bradley, Christopher Lonsdale. *Prior House, Richmond, Yorkshire.*
1850. June 4.*Brady, Sir Antonio, F.G.S., F.R.M.S., F.A.S.L. *Maryland Point, Stratford, Essex,* E. (TRUSTEE.)
1869. Nov. 17.*Branfill, Major B. R. *Great Trigonometrical Survey of India, Bangalore.*
1862. Mar. 19. Brewin, Arthur, F.R.A.S. 2 *Copthall Chambers, Angel Court, Throgmorton Street,* E.C. (VICE-PRESIDENT.)
1862. Mar. 19. Bright, Sir Charles Tilston, M.Inst.C.E., F.R.A.S., F.R.G.S. *Westminster Chambers, Victoria Street,* S.W.; *and* 50 *Old Broad Street,* E.C.
1862. Mar. 19. Bright, Edward Brailsford, F.R.A.S. 50 *Old Broad Street,* E.C.
1873. Jan. 15. Bromfield, John Coley C. 38 *Russell Square, Brighton.*
1850. Aug. 7. Brooke, Charles, M.A., F.R.S., F.R.C.S., F.R.M.S., F.R.B.S., Surgeon to the Westminster Hospital. 16 *Fitzroy Square,* W. (SECRETARY.)
1850. June 4. Brown, Isaac, F.R.A.S. *Kendal.*
1865. Mar. 15. Browning, John, F.R.A.S., F.R.M.S. 111 *Minories,* E.C.
1869. Feb. 17. Brumham, George D. 154 *Offord Road, Barnsbury,* N.
1854. Nov. 28. Burder, George Foster, M.D. 7 *South Parade, Clifton, Bristol.*
1857. May 26. Burge, Frederick John, M.R.C.S., F.R.M.S., Medical Officer of Health, Fulham District. *Broomsgrove Villa, New Road, Shepherd's Bush,* W.

1869. June 16. Bush, Rev. Thomas Henry, M.A. *Burton, Christchurch, Hants.*
1862. June 18. Butter, D., M.D., Inspector-General of Hospitals, Bengal Army, Retired List. *Hazelwood, Church Road, Upper Norwood*, S.E.
1873. Jan. 15. Byron, Rev. John, M.A. *Killingholme Vicarage, Ulceby, Lincolnshire.*

1856. Mar. 25. Camps, William, M.D.
1862. June 18. Canning, Sir Samuel. *The Manor House, Abbots Langley, Watford, Herts.*
1868. Apr. 15. Cann-Lippincott, R. C.
1867. Feb. 20.*Carpenter, Alfred, M.D. *Croydon.*
1862. Jan. 15.*Casella, Louis P., F.R.A.S., F.R.G.S. 147 *Holborn Bars*, E.C.; *and South Grove, Highgate*, N.
1863. June 17. Cathcart, E. *Auchendrane House, Ayr, N.B.*
1862. Mar. 19. Cator, Charles O. F., M.A. *Parkside, Beckenham*, S.E.; *and Wentworth House, Pontefract.*
1850. May 7. Chevallier, Rev. Temple, B.D., F.R.A.S. *University, Durham.*
1869. Nov. 17. Chichester, Captain Henry. *Fartown, Huddersfield.*
1861. Jan. 16.*Chimmo, Commander William, R.N., F.R.A.S. *Hydrographic Office, Whitehall*, S.W.
1864. Feb. 17. Churchill, F., Jun., M.D. 3 *Harcourt Street, Dublin.*
1862. Mar. 19.*Clark, Edwin, M.Inst.C.E., F.R.A.S. 5 *Westminster Chambers, Victoria Street*, S.W.; *and Observatory House, Forest Hill*, S.E.
1862. Mar. 19. Clark, Josiah Latimer, M.Inst.C.E., F.R.G.S., F.R.M.S. 5 *Westminster Chambers, Victoria Street*, S.W.; *and Beechmont, Sydenham Hill*, S.E.
1852. June 22. Clerk, Henry, Col. R.A., F.R.S. 3 *Hobart Place, Eaton Square*, S.W.
1862. Jan. 15. Cockburn, The Hon. Samuel, F.R.A.S., Police Magistrate. *Belize, British Honduras.*
1860. June 6. Collingwood, Edward John, F.R.A.S. *Lilburn Tower, Alnwick, Northumberland.*
1865. Jan. 18. Colomb, Commander H. P., R.N. *Roxetti Villa, Harrow*, N.W.
1863. Jan. 21. Colthurst, Joseph, M.Inst.C.E., F.G.S. *Dripsey Castle, Coachford, Cork.*
1867. Feb. 20. Compton, Thomas Armetriding, B.A., M.D., L.R.C.P. Lond., M.R.C.S. Eng. *Holmwood, Bournemouth, Hants.*
1862. June 18. Coode, Sir John, M.Inst.C.E., F.G.S. 2 *Westminster Chambers, Victoria Street*, S.W.; *and* 35 *Norfolk Square, Hyde Park*, W.
1870. Mar. 16. Cook, Henry, M.D., F.R.G.S., F.G.S. *Ringmore, Teignmouth, Devon.*
1864. Feb. 17. Cooper, Sir Daniel, Bart. 20 *Princes Gardens, South Kensington*, S.W.
1872. June 19. Cooper, William F. 58 *New Shoreham Street, Sheffield.*
1864. Apr. 20.*Coppock, Charles, F.R.A.S., F.R.M.S. 38 *Arthur Road, Holloway*, N.; *and* 31 *Cornhill*, E.C.

1866. June 20. Courtauld, Samuel. 76 *Lancaster Gate*, W.
1862. Nov. 19. Cramp, Robert. 127 *High Street, Ramsgate, Kent.*
1862. Nov. 19.*Crofton, Henry M. E., F.R.A.S. *Inchinappa, Ashford, Co. Wicklow.*
1870. Jan. 19. Crompton, Rev. Joseph, M.A. *Bracondale, Norwich.*
1863. Jan. 21.*Croskey, James Rodney, F.R.G.S. *Forest House, High Beech, Essex.*
1862. June 18. Cross, Rev. John Edward, M.A., F.R.A.S. *Appleby Vicarage, Brigg.*
1864. Mar. 16. Crossley, Louis J. *Moorside, Halifax.*
1862. Mar. 19. Cull, Richard, F.S.A., F.R.G.S. 13 *Tavistock Street, Bedford Square*, W.C.
1862. June 18. Curtis, John. *Roseleigh, Heaton Chapel, Manchester.*

1866. Feb. 21. Davis, Thomas Henry. *Orleton, Worcester.*
1863. Nov. 18.*Deane, Henry, F.L.S., F.R.M.S. 17 *Pavement, Clapham*, S.W.
1863. Nov. 18.*Deane, Henry, Jun., B.A. *Allofen, Hungary; and* 17 *Pavement, Clapham*, S.W.
1873. Jan. 15. Delaney, John, Postmaster-General. *St. John's, Newfoundland.*
1867. Apr. 17.*De La Rue, Warren, Ph.D., D.C.L., F.R.S., F.R.A.S., F.R.M.S., F.C.S., M.R.I., &c. *The Observatory, Cranford, Middlesex*, W.; *and Reform Club, Pall Mall*, S.W.
1864. Apr. 20. Dines, George. *Grosvenor Road, Pimlico*, S.W.; *and Ewell Road, Surbiton, Surrey.*
1862. June 18. Dobson, George Clarisse, M.Inst.C.E. *Holyhead Harbour.*
1864. Apr. 20. Dodgson, Henry, M.D., F.R.A.S. *Cockermouth, Cumberland.*
1863. Nov. 18. Doncaster, Daniel, Jun. *Green Bank, Victoria Road, Broomhall Park, Sheffield.*
1866. Apr. 18. Dymond, Edward Ernest. *Oaklands, Aspley Guise, Woburn, Beds.*
1850. May 7.*Dymond, William Philip. *Falmouth.*

1857. Mar. 24.*Eaton, Henry Storks, M.A. *Bridy Lodge, Chepstow Road, Croydon; and* 25 *Great George Street*, S.W.
1850. May 7. Ebury, Lord. 107 *Park Street, Grosvenor Square*, W.
1864. Feb. 17.*Eccles, John William. 9 *Old Square, Lincoln's Inn*, W.C.
1870. June 15. Ellis, William Cuzens. *Army Medical Department, Garrison Hospital, Portsea, Hants.*
1851. Aug. 26.*Ellis, William Horton. *Hartwell House, Exeter.*
1871. Mar. 15. Embrey, George. *George Street, Lozells, Birmingham.*
1873. Jan. 15. Esdaill, James Kennedy, B.A. *Saint Hill Place, East Grinstead, Sussex.*
1866. Mar. 21. Evans, Franklen George, M.R.C.S.E. *Tynant, Radyr, Cardiff.*
1871. Jan. 18. Eyre, Rev. William Leigh Williamson. *Northchurch, Great Berkhampstead.*

1873. Jan. 15. Falkner, Rev. Thomas Felton, B.A. *St. Thomas's College, Colombo.*

1860. Jan. 18. Falls, William Stewart, M.D. *Bournemouth, Hants.*
1868. Feb. 19. Festing, A. Morton, Deputy Paymaster, Control Staff. 1 *Clifton Villas, Montenotte, Cork.*
1866. Apr. 18. Field, Edmund. *High Wickham, Hastings.*
1865. Feb. 15. Field, Rogers, B.A., Assoc.Inst.C.E. 5 *Cannon Row, Westminster*, S.W.
1850. May 7. Fletcher, Isaac, M.P., F.R.S., F.R.A.S., F.G.S. *Tarn Bank, Carlisle.*
1854. Mar. 28. Forbes, Arthur. *Culloden House, Inverness, N.B.*
1863. Jan. 21. Ford, William Henry. *Park Villa, Merridale, Wolverhampton.*
1862. June 18. Foster, William. *Lecourt, Petersfield.*
1870. Jan. 19. Fox, Cornelius Benjamin, M.D., M.R.C.P. *Penquite Lodge, Scarborough.*

1865. Feb. 15. Gallwey, Lieut. F., R.A. *India.*
1864. June 15. Gassiot, John P., D.C.L., F.R.S., F.C.S. 77 *Mark Lane*, E.C.; *and Clapham Common*, S.W.
1864. Feb. 17.*Gaster, Frederic. *Meteorological Office*, 116 *Victoria Street*, S.W.; *and Laurel Villa, Acre Lane, West Brixton*, S.W.
1866. Apr. 18. Gibson, Charles Mends. *Windermere House, Torquay.*
1870. Nov. 16. Gilbert, Joseph Henry, Ph.D., F.R.S., F.C.S. *Harpenden, St. Albans.*
1850. Apr. 3.*Glaisher, James, F.R.S., F.R.A.S., F.R.M.S., Superintendent of the Magnetic and Meteorological Department, Royal Observatory, Greenwich. 1 *Dartmouth Place, Blackheath*, S.E. (SECRETARY.)
1865. Nov. 15. Gledhill, Joseph, F.G.S. *Bermerside Observatory, Halifax.*
1850. May 7. Graham, John. *Prebend Row, Darlington, Durham.*
1851. Mar. 11. Greaves, Charles, M.Inst.C.E. *East London Waterworks, Old Ford, Bow*, E.
1867. Nov. 20. Griffith, Rev. Charles H., M.A. *The Rectory, Strathfield Turgiss, Winchfield, Hants.*

1871. Feb. 15. Hall, John James. 17 *Rosemont Villas, Richmond Hill, Surrey.*
1862. Mar. 19. Hammond, Arthur Oldfield. *Lloyds*, E.C.; *and St. Mary's Lodge, Blackheath*, S.E.
1866. Apr. 18. Harding, James Staughton. *Meteorological Office*, 116 *Victoria Street*, S.W.
1867. Nov. 20. Harris, William John, M.R.C.S.E., L.S.A. 13 *Marine Parade, Worthing, Sussex.*
1866. Feb. 21. Harrison, William Frederick. *Bartropps, Weybridge, Surrey.*
1856. Jan. 22. Hawksley, Thomas, M.Inst.C.E. 30 *Great George Street, Westminster*, S.W.
1856. Jan. 22.*Heath, Richard Ford, B.A., L.C.P., F.R.A.S. *Totteridge Park, Herts.*
1864. Nov. 16. Henriques, A. 67 *Upper Berkeley Street*, W.
1863. June 17. Hering, William, M.D. 5 *Wimpole Street, Cavendish Square*, W.
1862. June 18. Heywood, James, F.R.S., F.G.S., F.S.A. 26 *Kensington Palace Gardens*, W.; *and Athenæum Club, Pall Mall*, S.W.

1864. Nov. 16. Hicks, James. 8 *Hatton Garden*, E.C.
1850. May 7.*Hippisley, John, F.R.S., F.R.A.S. *Stoneaston, Bath.*
1868. Nov. 18.*Hobson, Arthur S., F.C.S. 3 *Upper Heathfield Terrace, Turnham Green*, W.
1872. Nov. 20.*Hodgson, Henry Tylston. *Harpenden, St. Albans.*
1863. Jan. 21. Hollond, Robert. *Stanmore Hall, Great Stanmore, Middlesex*, N.W.
1867. June 19.*Holmes, Robert Langley. *Marsh Gibbon Rectory, Bicester.*
1850. May 7. Hoskins, Samuel Elliott, M.D., F.R.S., F.R.C.P. *Guernsey.*
1869. Nov. 17.*Hudson, Henry, M.D. *Glenville, Fermoy, Co. Cork.*
1872. Nov. 20. Hughes, William Cumberland. *Saint Bees, Cumberland.*
1873. Jan. 15. Humber, William, Assoc.Inst.C.E. 20 *Abingdon Street, Westminster*, S.W.
1856. May 27. Huyshe, Rev. John, M.A. *Clysthydon Rectory, Cullompton, Devon.*

1862. Nov. 19. Ingelow, W. F. 15 A *Holland Street, Kensington*, W.
1869. Feb. 17. Ingram, Rev. Henry Brown.
1862. Mar. 19. Inwards, Richard, F.R.A.S. 20 *Bartholomew Villas, Kentish Town*, N.W.

1872. Nov. 20. Jardine, John Lee. *Capel, Surrey.*
1850. May 7. Jeans, James William, M.R.C.S., F.R.A.S. *Grantham, Lincolnshire.*
1869. Nov. 17. Jervis, Commander J. J. W., R.N.
1862. Mar. 19. Johnson, Edward Daniel, F.R.A.S. 9 *Wilmington Square*, W.C.
1861. Jan. 16.*Johnson, Henry, F.R.A.S. 39 *Crutched Friars*, E.C.
1873. Jan. 15. Johnson, John. *Larches Cottage, Wigan Lane, Wigan.*
1850. Apr. 4.*Johnson, William, F.R.A.S. *North Bar, Banbury.*
1863. Mar. 18. Jones, Samuel Urwick. 4 *Upper Parade, Leamington.*

1870. Apr. 20. Kains-Jackson, Henry. 60 *Mark Lane*, E.C.
1864. Jan. 20. Kierzkowski, Charles Ferdinand de, Assoc.Inst.C.E. 103 *Cannon Street*, E.C.
1864. June 15.*Kingsbury, William Joseph, M.Inst.C.E. 1 *Blandford Square, Regent's Park*, N.W.
1851. Nov. 25.*Knapping, Dale. *Suttons, South Shoeburyness.*

1869. Feb. 17. Lancaster, William James. *Colmore Row, Birmingham.*
1868. Nov. 18. Langton, Charles Augustus, M.A. *Sandfield House, Birkdale Park, Southport.*
1864. June 15.*Lawes, John Bennet, F.R.S. *Rothamstead, St. Albans, Herts.*
1873. Jan. 15. Ley, Rev. William Clement, M.A. *Breinton Vicarage, Hereford.*
1864. June 15. Livesay, John Gillett, Assoc.Inst.C.E. *Cromarty House, Ventnor, Isle of Wight.*
1868. Nov. 18. Loewy, Benjamin, F.R.A.S. 6 *Hilldrop Crescent, Holloway*, N.
1850. May 7.*Lowe, Capt. Arthur S. H., F.R.A.S. *Highfield House, Nottingham.*

1850. Apr. 3.*Lowe, Edward Joseph, F.R.S., F.R.A.S., F.L.S., F.G.S., F.Z.S. *Highfield House, Nottingham.*

1862. Mar. 19. M'Clean, John Robinson, F.R.S., M.Inst.C.E., F.R.A.S. 23 *Great George Street*, S.W.
1865. Apr. 19. Mackenzie, J. Ingleby, M.B. *Belgrave House, Sidmouth.*
1869. Feb. 17. Mackenzie, William. 10 *Montpelier Street, Brighton.*
1862. June 18. Mackereth, Thomas, F.R.A.S. *The Observatory, Eccles, Manchester.*
1860. Mar. 16. McLandsborough, John, M.Inst.C.E., F.G.S. 15 *New Exchange, Bradford; and Victoria Park, Shipley, Leeds.*
1850. May 7.* McLaren, John. *Cardington, Bedford.*
1867. Nov. 20. Mann, James. *The Ferns, Green Lanes, Stoke Newington*, N.
1867. Mar. 20. Mann, Robert James, M.D., F.R.A.S., F.R.G.S. 5 *Kingsdown Villas, Wandsworth Common*, S.W.
1873. Jan. 15. Marriott, Frederick J. *Perry Hill, Sydenham, Kent*, S.E.
1870. Apr. 20. Marriott, William. 30 *Great George Street, Westminster*, S.W. (Assistant Secretary.)
1870. Nov. 16. Marten, Charles Rous, Director of Observatory. *Martendale, Southland, New Zealand.*
1869. June 16. Martin, James. 58 *Arundel Square, Barnsbury*, N.
1869. June 16. Martin, John M. *Lower Musgrave House, Exeter.*
1866. June 20. May, Rev. Edward John, D.D. *Bilborough Rectory House, Nottingham.*
1868. Apr. 15. Meldrum, Charles, M.A., F.R.A.S. *The Observatory, Mauritius.*
1863. Jan. 21.*Melhuish, Arthur James, F.R.A.S. 12 *York Place, Portman Square*, W.
1866. Apr. 18. Mercer, John, Jun. *Great Harwood, Blackburn, Lancashire.*
1872. Nov. 20. Merrifield, John, Ph.D., F.R.A.S. *Navigation School, Gascoyne Place, Plymouth.*
1870. Feb. 16. Miller, Samuel Henry, F.R.A.S. 8 *Victoria Road, Wisbech.*
1866. Mar. 21.*Morgan, Thomas H.
1865. Feb. 16. Moser, Frederick. *Carbery, Christchurch, Hants.*
1869. Nov. 17. Murray, James. 1 *Royal Exchange*, E.C.
1858. Mar. 29. Mylne, Robert William, F.R.S., F.G.S., F.S.A. 21 *Whitehall Place*, S.W.

1864. June 15. Nash, William Carpenter. *Royal Observatory, Greenwich; and* 6 *Morden Terrace, Lewisham Road, Greenwich*, S.E.
1864. June 15.*Neate, Charles, M.Inst.C.E. 35 A *Great George Street, Westminster*, S.W.
1855. Nov. 27. Negretti, Henry A. L. *Holborn Viaduct*, E.C.
1872. Nov. 20. Nelson, Richard J. *Kent Terrace, Kendal, Westmoreland.*
1867. Apr. 17. Newnham, Rev. Philip Hankinson, M.A. *Frome Vauchurch Rectory, Dorchester.*
1872. Feb. 21. Newton, Frederick. 3 *Fleet Street*, E.C.
1858. Jan. 20.*Nicholson, Sir Charles, Bart., LL.D. 26 *Devonshire Place, Portland Place*, W.
1870. Feb. 16.*North, Alfred, F.R.G.S. 23 *Lansdowne Crescent, Notting Hill*, W.

1862. Mar. 19. Orde, Sir John Powlett, Bart. *Kilmory, Lochgilphead; and North Uist, N.B.*
1868. Apr. 15. Orton, Rev. William Previté, M.A. *Brassington Vicarage, Wirksworth, Derbyshire.*

1864. Apr. 20. Pain, Walter E. *Sidney Street, Cambridge.*
1854. Nov. 28. Paine, William Henry, M.D. *Corbett House, Stroud, Gloucestershire.*
1864. June 15. Parkes, William, M.Inst.C.E. 23 *Abingdon Street, Westminster,* S.W.
1866. June 20. Pastorelli, F. 208 *Piccadilly,* W.
1854. Nov. 28. Pearson, Charles B. N. *Knebworth, Herts.*
1850. June 4.*Perigal, Henry, F.R.A.S., F.R.M.S. 9 *North Crescent, Bedford Square,* W. (Treasurer.)
1869. Apr. 21.*Perry, Rev. Stephen J., M.A., F.R.A.S. *Stonyhurst College, Blackburn.*
1863. June 17.*Pigott, George Granado Graham Foster, F.R.A.S. *Manor House, Abington Pigott's, Cambridgeshire.*
1862. Mar. 19. Preece, William H., M.Inst.C.E. *Grosvenor House, Grosvenor Square, Southampton.*
1864. June 15. Preston, Rev. Thomas Arthur, M.A. *Marlborough College, Wilts.*
1850. May 7. Prince, Charles Leeson, M.R.C.S., F.R.A.S. *The Observatory, Crowborough Beacon, Tunbridge Wells.*

1855. Nov. 27. Redford, Rev. Francis, M.A., F.R.S.E. *The Rectory, Silloth, Cumberland.*
1850. Aug. 7.*Reynolds, William, M.D. *The Cloisters, St. Michael's Hamlet, Liverpool.*
1858. Nov. 17.*Rock, James, F.S.A. *Domons, Northiam, Sussex.*
1871. Feb. 15. Rowley, Edwin. 128 *St. James's Street, Brighton.*
1868. Nov. 18. Russell, The Hon. Francis A. Rollo. *Pembroke Lodge, Richmond,* S.W.

1867. Nov. 20. Salmon, William, R.N. *Meteorological Office,* 116 *Victoria Street,* S.W.
1862. Mar. 19.*Saunders, W. Wilson, F.R.S., F.L.S. *Lloyds,* E.C.; *and Hill Field, Reigate.*
1870. Nov. 16. Sawyer, Frederick Ernest. 55 *Buckingham Place, Brighton.*
1871. Mar. 15. Scott, Robert H., M.A., F.R.S., F.G.S., Director of the Meteorological Office. 116 *Victoria Street,* S.W.; *and* 36 *Onslow Square,* S.W. (Vice-President.)
1867. Mar. 20.*Secretary of the Royal Artillery Institution. *Woolwich,* S.E.
1867. Jan. 16. Segrave, Henry E. 21 *Dorset Square,* N.W.
1850. May 7. Shellabear, Samuel. *Holkham, Norfolk.*
1862. June 18. Shuter, James L., F.R.A.S., F.R.M.S. 33 *Farringdon Street,* E.C.
1862. Mar. 19.*Silver, Rev. Frederick, M.A., F.R.A.S., F.G.S., F.R.G.S. *Rectory, Norton-in-Hales, Market Drayton, Salop.*
1860. June 6.*Silver, Stephen William, F.R.G.S. *Norwood Lodge, Crown Lane, Streatham,* S.; *and* 3 *&* 4 *Bishopsgate Street Within,* E.C. (Trustee.)

1863. Jan. 21. Simmonds, George Harvey. *Board of Trade, Whitehall Gardens*, S.W.
1862. Mar. 19.*Simms, James, F.R.A.S. 138 *Fleet Street*, E.C.
1870. Apr. 20. Simpson, James, Assoc.Inst.C.E. 29 *Great George Street, Westminster*, S.W.
1862. Jan. 15. Sladen, J. *Royal Artillery Institution, Woolwich*, S.E.
1850. Apr. 3.*Slatter, Rev. John, M.A., F.R.A.S. *Streatley Vicarage, Reading.*
1855. Nov. 27. Smelt, Rev. Maurice Allen, M.A., F.R.A.S. *Heath Lodge, Cheltenham.*
1862. Mar. 19. Smith, Basil Woodd, F.R.A.S. *Branch Hill Lodge, Hampstead Heath*, N.W.
1863. Jan. 21. Smyth, John, Jun., M.A. *Milltown, Banbridge, Ireland.*
1856. Mar. 25.*Smyth, Warrington W., M.A. F.R.S., F.G.S., Lecturer on Mining and Mineralogy at the Royal School of Mines, and Inspector of the Mineral Property of the Crown. *Jermyn Street; and* 92 *Inverness Terrace*, W.
1850. Oct. 8. Smythe, William James, Major-Gen. R.A., F.R.S., F.R.G.S. *Athenæum Club, Pall Mall*, S.W.
1853. Nov. 22.*Sopwith, Thomas, M.A., F.R.S., M.Inst.C.E., F.G.S., F.R.M.S. 103 *Victoria Street, Westminster*, S.W.; *and Allenheads, Haydon Bridge, Northumberland.*
1866. Apr. 18. Southall, Henry. *Ross, Hereford.*
1863. June 17.*Sowerby, William. *Royal Botanic Gardens, Regent's Park*, N.W.
1855. Nov. 27.*Stedman, Robert Savignac, M.R.C.S., F.R.M.S. *Sharnbrook, Bedford.*
1868. June 17.*Steward, Rev. Charles John. *Somerleyton Rectory, Lowestoft.*
1862. June 18. Stewart, Balfour, M.A., LL.D., F.R.S., F.R.A.S. *Owens College, Manchester.*
1862. Mar. 19.*Stewart, W., M.D. 37 *Southwick Street, Hyde Park*, W.
1866. Mar. 21. Stow, Rev. Fenwick William, M.A. *Harpenden, St. Albans, Herts.*
1865. Nov. 15. Strachan, Richard. *Meteorological Office*, 116 *Victoria Street*, S.W.; *and* 11 *Offord Road, Barnsbury*, N.
1863. June 17. Strange, Alexander, Lieut.-Col. H.M.I. Army (retired), F.R.S., F.R.A.S., F.R.G.S. *India Stores, Belvidere Road, Lambeth*, S.E.; *and* 41 *Brompton Crescent*, S.W. (FOREIGN SECRETARY.)
1850. June 4.*Swann, Rev. Samuel Kirke, M.A., F.R.A.S. *Gedling, Nottingham.*
1870. Mar. 16. Swete, Horace, M.D. 6 *Clarence Terrace, Leamington.*
1870. Jan. 19. Sykes, Edwin John. *Devonshire Hospital, Buxton.*
1850. May 7.*Symonds, Frederick, M.R.C.S., F.R.M.S. 35 *Beaumont Street, Oxford.*
1856. Mar. 25. Symons, George James, F.R.B.S. 62 *Camden Square*, N.W. (VICE-PRESIDENT.)

1866. Nov. 21. Tabor, Henry Samuel. 16 *Lansdowne Road, Notting Hill*, W.
1869. June 16. Tarbotton, Marriott Ogle, M.Inst.C.E., F.G.S. *Newstead Grove, Nottingham.*

1860. Mar. 21. Tennant, James, F.G.S., F.C.S., F.R.M.S., F.Z.S., F.R.G.S., Professor of Mineralogy and Geology at King's College, London. 149 *Strand*, W.C.
1867. Mar. 20. Tennant, Lieut.-Col. James Francis, R.E., F.R.S., F.R.A.S., F.G.S. *India*.
1862. Nov. 19. Thrustans, John. 4 *Fair View Villas, Merridale, Wolverhampton.*
1872. Jan. 17.*Toynbee, Captain Henry, F.R.A.S., Marine Superintendent. *Meteorological Office*, 116 *Victoria Street*, S.W.; *and* 25 *Inverness Terrace*, W.
1856. May 27. TRIPE, JOHN W., M.D., Medical Officer of Health. *Town Hall, Hackney*, E.; *and* 172 *Richmond Road, Hackney*, E. (PRESIDENT.)
1864. Feb. 17. Trotter, Clarence Edward, Assoc.Inst.C.E., F.R.A.S. *Civil and Military Club, Regent Street.*
1867. Feb. 20. Tuckwell, Rev. W. *The College School, Taunton.*
1850. June 4. Tudor, Edward Owen, F.S.A. 80 *Portland Place*, W.
1867. Apr. 17. Tupman, Captain George Lyon, R.M.A., F.R.A.S. *Eastney, Portsmouth.*
1871. Mar. 15. Turner, John. 217 *Great Colmore Street, Birmingham.*
1872. Nov. 20. Turner, Mansfield. *Claremont Buildings, Shrewsbury.*
1862. June 18. Twigg, Robert Harkness, Assoc.Inst.C.E. 155 *Fenchurch Street*, E.C.
1871. Apr. 19. Tyrer, Richard. *Victoria Villas, Mansfield, Notts.*

1869. June 16. Usill, George William, Assoc.Inst.C.E. 3 *Great Queen Street, Westminster*, S.W.

1866. Jan. 17.*Verney, Edmund Hope, Commander R.N., F.R.A.S. *Claydon House, Bucks.*
1850. May 4. Vernon, George Venables, F.R.A.S., M.A.I. 1 *Osborne Place, Old Trafford, Manchester.*
1856. Nov. 25.*Vicary, William, F.G.S., F.R.M.S. *The Priory, Colleton Crescent, Exeter.*
1863. Jan. 21. Vivian, Edward. *Woodfield, Torquay, Devon.*

1850. June 4. Walker, Charles Vincent, F.R.S., F.R.A.S. *Fernside, Red Hill, Reigate.* (VICE-PRESIDENT.)
1864. Feb. 17. Walker, Malcolm M^cNeal, F.R.A.S. 5 *Cecil Place, Glasgow.*
1862. Nov. 19. Ward, Colonel Michael Foster, F.R.A.S.
1869. June 16.*Waterhouse, John, F.R.S., F.R.A.S., F.G.S., F.R.M.S. *Halifax, Yorkshire.*
1850. May 7. Weld, Rev. Alfred, B.A., F.R.A.S. *St. Beuno's College, St. Asaph, North Wales.*
1850. Apr. 3.*Whitbread, Samuel Charles, F.R.S., F.R.A.S. 56 *Rutland Gate, Knightsbridge*, S.W.; *and Southhill, Biggleswade.*
1862. Mar. 19. Whitehouse, E. O. Wildman, Assoc.Inst.C.E. *Pilgrim Lane, Hampstead*, N.W.
1860. Jan. 18. Whitfield, John, M.Inst.C.E. 12 *Writer's Buildings, Dalhousie Square, Calcutta; and Raneegunge, Bengal, India.*
1862. Mar. 19. Whitley, Nicholas, C.E. *Truro.*
1867. Feb. 20.*Williams, Sir Frederick M., Bart., M.P. *Goonvrea, Truro.*

1872. Nov. 20. Wilson, James Maurice, M.A., F.R.A.S. *Hillmorton Road, Rugby.*
1870. Nov. 16. Wilson, Thomas Henry. *Harpenden, St. Albans.*
1850. May 7. Winstanley, William. *West Cliff, Preston.*
1872. June 19. Woodd, Charles Henry Lardner, F.G.S. *Roslyn, Hampstead,* N.W.
1854. Jan. 24. Woodhouse, John Thomas, M.Inst.C.E. *Overseal, Ashby-de-la-Zouch, Leicester; and Midland Road, Derby.*
1851. Feb. 11. Wortham, Hale, F.R.A.S. *Royston, Herts.*
1870. Apr. 20. Wright, Thomas. 20 *The Vale, Blackheath,* S.E.
1850. Nov. 12.*Wright, Thomas Barber. *Birmingham.*

1855. Nov. 27. Zambra, Joseph Warren. *Holborn Viaduct,* E.C.

HONORARY MEMBERS.

1870. June 15. Denza, Prof. Francesco. *Director of the Observatory, Moncalieri, Italy.*
1862. June 18. Dove, Prof. Heinrich Wilhelm. *Berlin.*

1855. Mar. 27. Graham, Major George. *Registrar-General of Births, Deaths, and Marriages, Somerset House,* W.C.

1852. Mar. 23. Maury, M. F., Commodore, LL.D., A.R.A.S.L. *Virginia Military Institute, Lexington, Va., U.S.*

1850. May 7. Phillips, Charles Gerrans, Comm. R.N.

1851. May 27. Quételet, Prof. A., F.R.S.L., A.R.A.S.L. *Director of the Observatory, Brussels.*

1862. June 18. Regnault, Prof. Henri Victor. *Paris.*

It is requested that notification of any change of residence will be immediately communicated to the Assistant Secretary.

Printed by Taylor and Francis, Red Lion Court, Fleet Street.

QUARTERLY JOURNAL

OF

THE METEOROLOGICAL SOCIETY.

VOL. II. No. 9.

I. *Notes on the Meteorology of Vancouver Island.* By ROBT. H. SCOTT, F.R.S.

[Read June 18, 1873.]

THE observations on which the following notes are based have been chiefly derived from the Registers kept on board H.M.SS. 'Hecate' and 'Plumper,' when engaged in the Survey of the Western Coast of British North America, under the command of Captain, now Rear-Admiral G. H. Richards, C.B., during the years 1857 to 1863, and from Registers kept by Captain J. Trivett, on various voyages.

The tract from which the observations which have been extracted have been collected is bounded by the parallels of 30° and 52°, and stretches out to seaward as far as the meridian of 140° W, while the coast trends in a south-easterly direction from about 130° W in 55° N to about 116° W in 30° N.

These limits, however, give a very imperfect idea of the actual area for which a really satisfactory amount of information is presented to us, and which is confined to the subsquare known to meteorologists as 157 *c*, extending in Latitude from 45° to 50° N, and in Longitude from 120° to 125° W. These comparatively narrow limits comprise the most practically important part of the coast, as within them are situated the Fuca Straits, with the harbours of Esquimalt and Victoria, and a considerable stretch of the coast line of the United States, south of Cape Flattery as far as Cape Foulweather.

Although we have, in the Meteorological Office, deduced mean values for all the elements given in the registers for the whole region, I do not consider it advisable to lay before the Society the data for any of the other subsquares, except 193 *b*, which lies along the coast immediately to the northward of 157 *c*, and reaches nearly to Sitka. The number of observations for any single element for any month bears a very low proportion to

that available for subsquare 157 *c*, for which the means have been calculated in every month from about 250 sets of observations. In no other subsquare, except 193 *b*, are there, except in three single instances, all in one square, even as much as one-fifth of the above number of observations available.

It is evident that such means as have just been mentioned can carry hardly any weight; and from their frequent disagreement, from the comparatively well-established means for square 157 *c*, it appears that the observations were often taken under exceptional conditions of weather, and that they cannot be regarded as in any way representing the normal meteorology of the district.

The Barometrical and Thermometrical means have been deduced from the simple average of the readings at 4 a.m., noon, and 8 p.m., as was the case with the data published for Cape Horn.* As regards the Temperature, it will be remembered that the data for this element obtained on board ship must necessarily differ essentially from that which would be yielded by observations taken on shore, owing to the impossibility of obtaining an exposure for the thermometers in any way fulfilling the conditions required for a thermometer screen on land.

The monthly march of the Barometer gives a curve which is rather irregular, showing a maximum in December, and two secondary maxima in April and July. The minimum is in March; and it is only in the three months of February, March and June that the mean is below 30 inches. The figures do not show much correspondence with those given by Mr. Buchan for the two stations of New Westminster and Esquimalt;† but, as these means do not agree among themselves very closely, and are given for only two years and one year respectively, the deduction can only be drawn that more information on the subject of the barometrical pressure in the district is very desirable. The values given by me at least possess the merit of having been obtained from a considerable number of observations made with verified instruments.

The means for Temperature exhibit a very regular curve, having its minimum 39°3 in December, and its maximum 59°3 in July. The most interesting facts about the extremes are that the curve is remarkably flat at the epochs of both maximum and minimum; so that it will be seen that the temperature, on the whole, resembles that of the North of Ireland, as given by Mr. Buchan;‡ for, while the annual mean for Vancouver is 48°8 and the extreme monthly range is 20°0, the corresponding figures for Belfast are 48°8 and 19°8.

At the latter station, however, the coldest month is January, not December; and the contrast between July and August is 0°9, instead of only 0°3, as in subsquare 157 *c*.

* "Contributions as to our knowledge of the Meteorology of Cape Horn and the West Coast of South America." Published by authority of the Meteorological Committee. London: Stanford, 1871. Price 2s. 6d.

† A. Buchan "On the mean pressure of the Atmosphere, &c." Transactions R. S. Ed. Vol. xxv. p. 610.

‡ "Journal of the Scottish Meteorological Society." Vol. iii. p. 110.

The curve of Sea Surface Temperature is, in some respects, remarkable. It, as usual, reaches its extreme points about a month later than that of air temperature. Starting in January 3°4 above the latter, it passes through its minimum in February; intersects the air temperature curve about the end of April; in June exhibits its greatest negative divergence of 4°3, and reaches its maximum in August, when, for two months, the two curves almost coincide with each other. It finally attains its greatest positive divergence of 5°8 in December.

As regards the notations of Weather, as two or more entries, as *c q*, often appear at one hour, the total number of entries does not agree with the total number of observations. "Blue sky" (*b*) reaches a decided maximum in July, while "detached clouds" (*c*) are equally reported throughout the year, and the sky is more frequently entirely overcast (*o*) in November and March than in other months. The contrast in respect of this observation between March and April is very striking. Mist (*m*) is at its highest figure in September, but is nearly equally prevalent from July to the end of the year. Fog (*f*) is only noticed in the autumn and winter, and is at a strongly marked maximum in November. Rain (*r*) is most frequent in March, and least so in July and August. Thunder and lightning are rare.

The Wind Observations for the square bear unmistakable evidence of their having been, for the main part, taken in harbour or in land-locked waters, as, out of the total number of observations, nearly one-half are calms. I have, therefore, deemed it unadvisable to reproduce them; and I am confirmed in this course by reference to Admiral Richards, and the other Officers who were with him on the Vancouver Survey.

The data for subsquare 193 *b*, lying along the coast immediately to the northward of 157 *c*, are only for the summer months, and are comparatively so scanty, that nothing but the extreme rarity of information from the district justifies their being printed, and any discussion of them seems unnecessary.

In conclusion, I would only remark that it is my hope that this short notice may get into the hands of some Captains sailing to the North West Coast of America, and may be the means of inducing them to commence observing regularly, so as gradually to enable us to amass materials for the entire district referred to in the first paragraph, which will permit us to deduce trustworthy means for the various elements, and thereby to furnish an important contribution to our knowledge of the Meteorology of the Globe.

SQUARE 157 *c*. LATITUDE 45°—50° N. METEOROLOGY OF VANCOUVER ISLAND. LONGITUDE 120°—125° W.

Months.	No. of years represented.	Barometer. Average.	Barometer. No. of Obsns.	Temp. of Air. Average.	Temp. of Air. No. of Obsns.	Cloud. Average Amount 0—10	Cloud. No. of Obsns.	Weather. Total Obsns.	Sky. b.	Sky. c.	Sky. o.	Atmosphere. m.	Atmosphere. f.	Rain. r and h.	Rain. s.	q.	t and l.	Temp. of Sea. Average.	Temp. of Sea. No. of Obsns.
		Ins.		°														°	
January ..	3	30·021	273	40·0	268	5·8	195	241	48	102	83	14	4	59	4	24	2	43·4	70
February ..	3	29·970	250	39·9	243	6·3	237	239	31	129	76	14	—	44	3	28	—	43·0	52
March	3	29·921	273	42·6	270	6·3	249	274	41	140	90	7	—	75	8	22	—	45·4	48
April	3	30·037	243	47·7	237	5·2	229	235	44	152	38	1	—	31	—	18	—	48·2	27
May	3	30·009	265	52·1	260	5·2	251	253	53	163	34	3	—	29	—	30	—	51·7	66
June	4	29·989	295	57·5	288	4·6	272	280	90	154	36	14	—	26	—	20	1	53·2	65
July	4	30·043	327	59·3	321	3·9	314	324	123	167	28	18	3	14	—	15	3	57·4	45
August	3	·039	264	59·0	246	4·6	244	262	76	135	42	35	5	17	—	28	2	58·9	51
September	3	·018	265	55·7	258	5·8	240	248	51	127	63	47	6	40	—	14	4	55·4	24
October ..	3	·037	273	49·7	250	5·7	251	274	56	126	77	42	7	46	—	22	—	49·1	20
November	3	·059	262	42·8	252	6·7	252	261	38	110	92	39	18	46	2	35	—	46·7	9
December	3	30·066	274	39·3	261	6·5	255	265	41	132	82	36	7	47	9	32	—	45·1	16
Averages......		30·017	3264	48·8	3154	5·6	2989	3156	692	1637	741	270	50	474	26	288	12	49·8	493

SQUARE 193 *b*. LATITUDE 50°—55° N. LONGITUDE 125°—130° W.

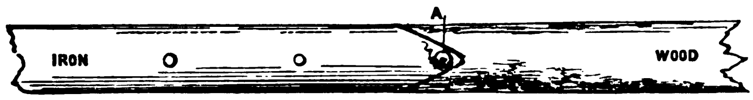
Months.	No. of years represented.	Barometer. Average.	Barometer. No. of Obsns.	Temp. of Air. Average.	Temp. of Air. No. of Obsns.	Cloud. Average Amount 0—10	Cloud. No. of Obsns.	Weather. Total Obsns.	Sky. b.	Sky. c.	Sky. o.	Atmosphere. m.	Atmosphere. f.	Rain. r and h.	Rain. s.	q.	t and l.	Temp. of Sea. Average.	Temp. of Sea. No. of Obsns.
April	2	30·070	102	43·6	102	7·4	102	102	10	39	54	27	1	25	1	12	—	45·3	18
May	2	29·977	138	49·1	138	6·0	138	138	36	47	55	34	1	26	—	14	—	47·9	37
June	1	29·857	12	52·6	12	8·8	12	12	—	4	8	9	—	1	—	1	—	52·3	4
July	2	30·051	69	57·4	69	7·4	69	69	8	26	35	33	—	9	—	1	—	55·0	20
August	1	30·001	51	57·2	44	7·0	47	47	3	21	22	8	1	5	—	—	—	52·8	9
September	2	30·071	69	53·8	63	6·5	59	67	9	27	27	14	6	15	—	3	—	54·1	18
October	1	29·859	18	48·8	18	6·9	18	18	3	8	7	4	—	7	—	3	—	50·7	6

II. *The Thunderstorm at Brighton on October 8th, 1873, and its Effects.* By F. E. SAWYER, F.M.S.

[Received November 14, 1873. Read November 19, 1873.]

DURING October 7th the atmosphere was very disturbed at Brighton. At 1.20 p.m. on that day a violent rainstorm came on, but lasted only a few minutes, and between 1 and 2 p.m. there was a whirlwind on the Race Hill, which caused considerable damage to a barn. The readings for 10 p.m. on the 7th were:—barometer (reduced to 32° and at sea level), 29·787 in.; dry-bulb, 46°2; wet-bulb, 45°5; wind N.W., force 2 (sea scale); no cloud.

On the morning of the 8th distant thunder was heard about 5.15, and was soon followed by lightning, and then the storm came on. The following description of the storm has been kindly furnished to me by Mr. J. G. B. Marshall, M.A. and M.E., the contractor for the new wall on the Undercliff Road, who was on the spot during the storm, when the men were killed. He says: "We had been at work on the beach since four o'clock; rain had fallen scarcely, and in big, fitful drops. At six o'clock, as I walked eastward towards these men, the tide was very low. The sun was shooting his rays over the horizon, and over a fringe of cloud, which hung on the waves; the western sky was dark and lurid; but over the sun there came suddenly a round, dense, little low black cloud, quite isolated, and near the Cliff, which is about 200 feet high at that spot. As I admired this lovely morning dawn, instantly a ball of fire dazzled my eyes, as if the sun had advanced within 20 yards, and gained his meridian splendour. I knew it was part of the thunderstorm; and it seemed so near, that I thought I would mark the distance by counting the time. I had but half thought so, when, quicker than thought, the report followed like the distinct boom of a heavy gun, intensified a thousand times, and the reverberation from the wall and over the rippling sea was something most awful. The only traces that remained were the two dead men and the shovel, which had the point of the iron strap which terminated in the wooden shaft fused or melted so that it formed a small round pellet, as would usually happen with molten metal, thus:—



The observations made by me at 9 a.m. on the 8th were:—barometer, 29·784 in.; dry-bulb, 46°5; wet-bulb, 44°6; wind NNW; force (sea scale), 2; cloud, 2; rain in last 24 hours 0·06 in.

The workmen on the Chain Pier state that there appeared to be two masses of thunder cloud, one in NW, and the other in SE, and the discharge took place between the two. The destructive flash passed, so they say, from the Albion Hotel to the Chain Pier Head (where they were at work), causing a sulphurous smell, and then went towards the beach at Kemp Town, where the men were killed.

It has been stated in the newspapers that "the lightning is said to have

hurled up the shingle on the beach like a whirlwind;" but Mr. Marshall informs me that the stones were not thrown about.

The two men who were struck were named William Albert Woolmer and Edward Bridges. Bridges was killed instantaneously: but Woolmer turned his eyes and moved his mouth; and his hair, shirt-collar, and a handkerchief on his shoulder were on fire when one of the labourers went up to him.

This destructive flash occurred at 6.10 a.m. The foreman, who was standing about 10 or 12 yards away from the two men, was knocked down by the flash; he stated at the inquest that it seemed like a thousand tons weight on his shoulders, pressing him down. Both of the men killed had shovels in their hands.

The storm appears to have been quite local, as the Meteorological Office only reported thunderstorms in Scotland on that morning. I have received, through the kindness of W. J. Harris, Esq., F.M.S., Worthing; C. L. Prince, Esq., F.R.A.S., Crowborough Beacon Observatory; Miss W. L. Hall, Eastbourne; and Alex. E. Murray, Esq., F.M.S., Hastings, notes on the storm of that day.

At Worthing the "early morning was very bright. After 5 a.m. thunder was heard, and at 6.3 a.m. a very heavy, prolonged roll, lasting from one-and-a-half to two minutes; heavy rain-fall succeeded this; wind from NW, veering to NE by 7 a.m.; fresh breeze from SE at 9 a.m." From Crowborough Mr. Prince writes:—"Your storm was a very local one, as the whole affair was visible from this Observatory. A large mass of cumulo-stratus cloud came to you from WSW, and was somewhat opposed, apparently, by a current from nearly due S. This mass of cloud lingered—in fact, remained stationary—for some time over Brighton. The lightning was very vivid and thunder very loud, even at this distance."

At Eastbourne "there were three very violent claps of thunder on that morning between 6 and 7, and two flashes of lightning, but it passed instantly."

At Hastings, "between 7 and 7.20 a.m., heavy thunder, apparently to southward." The Bulletin International of the Paris Observatory for the 8th says: "Gris Nez, le 8, à 7h. 30 matin; orage dans l'Ouest, venant rapidement—tonnerre."

It is evident, therefore, that the storm travelled from west to east, and must have gone out to sea soon after passing Brighton, as it passed to the south of Hastings; and thunder only was heard to the west of Gris Nez. The area of the storm was not great, as the distance from Worthing to Gris Nez is only 86 miles. The course of the storm was unusual; following the coast line, instead of being attracted by the hills, and going up one of the river beds, as storms in this county generally do. It is possible that this unusual path was caused by the wind blowing from NW (as Mr. Harris states) and then being turned into W by the southerly current, which Mr. Prince observed, driving the storm along the coast. Severe thunderstorms do not often occur at Brighton. It has been observed that storms coming up from

MONTHS.	1851	1852	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872	1873	Total, 1851 to 1872.
January	—	—	3	—	—	1	—	—	2	1	—	—	1	—	—	3	—	—	1	2	—	4	4	18
February	1	—	—	—	—	—	—	—	—	1	1	1	—	—	—	2	—	—	—	—	—	2	—	8
March	1	—	—	—	1	1	2	—	1	—	3	1	—	1	—	2	—	2	—	—	1	4	—	20
April	1	1	—	—	—	2	4	1	1	2	—	2	1	1	—	4	1	—	2	1	2	4	4	30
May	2	4	4	—	1	1	6	2	9	1	5	3	2	1	8	4	4	2	4	—	3	4	1	70
June	—	6	3	1	1	1	5	8	10	2	5	1	2	1	3	4	1	2	—	1	3	7	2	67
July	4	4	3	5	10	4	2	4	8	2	4	2	—	1	7	4	5	2	1	7	2	14	2	95
August	3	6	1	3	4	7	9	5	2	1	4	—	3	4	3	2	2	2	3	8	3	8	3	83
September	—	4	—	—	1	6	4	4	2	—	2	—	3	11	1	2	2	2	4	1	3	6	4	58
October	2	2	3	4	2	1	1	—	4	1	3	3	2	—	7	—	2	1	1	3	2	10	3	54
November	—	—	—	—	—	—	—	—	3	—	9	1	—	2	3	—	—	—	—	5	—	8		31
December	—	2	—	—	2	3	—	1	—	—	—	—	—	—	—	2	—	5	1	—	—	6		22
Total	14	29	17	13	22	27	33	25	42	11	36	14	14	22	32	29	17	18	17	28	19	77		556

the sea towards the town either go bodily, or else split up and go to the nearest river beds, namely, those of the Ouse and Adur.

In order to show the frequency of electrical disturbances in this county, and that such occurrence in the month of October is usual, I have compiled a Table somewhat similar to those given by Mr. Scott in his Paper read on March 20th, 1872.

The Table shows the total number of times electrical phenomena, including thunderstorms or lightning or thunder, were recorded by any observer in the county of Sussex since 1851, the information being gathered from every available source.

From this it will be seen that in 24 years only 4 Octobers have passed by without electrical disturbance. The frequency in each month of 1872 was very remarkable.

The discussion on this Paper will be found at p. 86.

III. *Some of the Considerations suggested by the Depressions which passed over the British Islands during September*, 1873. By F. Gaster, F.M.S.

[Received November 19. Read November 19, 1873.]

The very brief paper which I venture to submit to the consideration of the Fellows, is entitled "Some of the Considerations suggested by the Depressions which passed over the British Islands during September, 1873;" but I regret to say that want of time will prevent my entering now into more than one "consideration," which will be deemed, I trust, of sufficient importance to occupy their time for a few minutes.

When the month of September commenced, the central area of a considerable depression was lying over the north of the British Isles, producing light S.W. breezes over the greater part of Western Europe, rather fresh S.E. winds in Denmark and Norway, with light E. breezes in the extreme N. of our Islands. The centre now moved slowly in an E. or E.S.E. direction, reaching the eastern parts of the North Sea by the 3rd, but not advancing actually over Denmark until the 5th. At this time the depression became deeper, as was shown by a fall of the mercury at or near its centre, accompanied by a continued rise at our western stations. The increase of pressure in the rear of the centre was brisk, the wind in our Islands veered to N.W. or N., and a marked fall of temperature took place.

By 8 a.m. on the 6th, however, the mercury had begun to fall on all our own and the N. French coasts; the N. winds (which had blown with the force of a fresh gale over the North Sea during the 5th) moderated; temperature showed signs of rising in the S. of France, and by 8 a.m. on the 7th, the centre of the disturbance had returned W.N.W. towards the N. of Scotland.

At 8 a.m. on the 8th, the centre lay not very far to the N.E. of Aberdeen, and was undergoing the process of being "filled up;" so that the winds on our coasts, as they backed towards W., fell light. Thus closed the first series

of changes into which the weather of September appears to be naturally divided. Then came a new feature.

Before the region of low pressure just noted was finally dispersed, it travelled somewhat suddenly in an E. direction, disappearing over the S. of Norway between the 8th and 9th. The S. stations had felt in addition to the above a complication, caused by a smaller and shallow depression which crossed the country rather quickly from W. to E., bringing with it rather fresh S.W. to N.W. breezes, and a great deal of rain.

During the next three days, a new large disturbance passed over from W.S.W. to E.N.E., its centre being over Scotland on the morning of the 10th; and, after pausing there for a few hours, reached the S.W. coast of Norway on the following morning—at which time it had become much deeper. As it passed, two more of the smaller depressions crossed over our S. counties, one late on the 9th, the other early on the 11th, neither of which was so clearly marked as that noticed on the 7th; but they brought with them distinct cyclonic shifts of the wind, and much rain.

After an interruption, lasting for a day or two—during which time an arm of comparatively high pressure extended from Germany over the S. parts of the North Sea to the E. of England, accompanied by dry but foggy weather —the passage of large disturbances over us was resumed.

Between the 13th and 16th we were under the influence of a cyclonic system whose central area was very large, and consisted apparently of the union of two smaller disturbances. This, after changing its position somewhat irregularly at first, passed away in an E. direction. Its rains were felt everywhere, and its winds were of medium strength on *our* coasts, though they rose to a gale in Denmark on the 16th.

Between this time (16th) and the 21st two more well-defined depressions passed to the E., the track of their centres lying to the N. of the Scotch coast. With both of them the S. winds were slight, when compared with the W. winds prevailing on their S. sides, and the N.W. breezes in their rear; and in both cases, also, the winds produced in Norway were far more violent than those felt over the United Kingdom.

This closed the second series of changes felt during the month; and was followed by two anti-cyclones—which also travelled from W. to E.—under whose influence we continued, almost entirely, until the close of the month. The short interval between them sufficed for the production of a deep depression, which passed rapidly to the N.E., along the western borders of the first area of high pressure soon after it reached the E. shores of the German Ocean, and gave us strong S.W. breezes or gales along our W. coasts.

Here, then, we have three distinct periods of weather changes.

1. From 1st to 8th, during which we lay under the influence of one depression, whose centre was chiefly to the E. of us.

2. A period (8th to 21st) marked by the passage of depressions over us travelling from W. or W.S.W. towards the E.

3. An anti-cyclone period, lasting till the 30th, and during which we felt the peculiarities usually noticed during the prevalence of such influence.

Now, of the many things which strike us respecting the depressions, the first seems to be that during nearly the whole of the month—notably until the 21st—pressure was, on the whole, *highest in the extreme S. of Europe*, and the course of the depressions was then from W. to E. In other words, if we look from the region of highest to that of lowest pressure, the depressions passing between them did so from left to right. Let us consider what happened when the conditions were altered. On the 26th the first anticyclone had reached the eastern shores of the North Sea and become merged in the generally high reading over N. Germany and the Baltic—whereupon the depression which showed itself on our W. coasts, travelled N.E., thus following the same rule.

Now, with regard to the depression which prevailed during the first few days of the month one can speak with less certainty; for the cyclonic circulation round it was so extensive and observations from the extreme N. of Europe are so scanty, that we can arrive only approximately at the changes which occurred. But one thing is certain, viz. that it was not until the 7th, when pressure in Northern Europe gave way entirely, that the centre moved away permanently to the E., followed by the other ones we have mentioned.

I may perhaps be permitted to cite one more case—chosen purposely from another month—which goes a long way to confirm the view given above.

On Nov. 14-16, 1872, pressure was considerably higher over our N. and N.W. coasts than it was in S. Europe; and, during the time that it remained so, two well-defined depressions advanced from Holland over France, travelling from the E.N.E., and one of them continued its journey right across France, finally disappearing over the Bay of Biscay.

In presenting these views, I am anxious to avoid offering any theory whatever in explanation of them; but, if true, and I firmly believe it holds almost or quite invariably, the rule which I have indicated seems to my mind to be one of the utmost practical importance.

The information from which these remarks are drawn is derived almost wholly from the 'Daily Weather Reports.'

The discussion on this Paper will be found at p. 37.

IV. *On an improved form of Aneroid for determining Heights, with a means of adjusting the altitude scale for various temperatures.* By Rogers Field, B.A., F.M.S.

[Received November 15. Read December 17, 1873.]

The object aimed at in designing this improved form of Aneroid was, to simplify the correct determination of Altitudes in cases such as ordinarily occur in England, and the instrument is therefore arranged to suit moderate

elevations, say of 2,000 feet and under, and is not intended for more considerable heights. It is important to explain this at the outset, as some of the following remarks would not be applicable to the determination of the Altitudes of Mountains, with which the idea of barometrical measurement is so often associated.

Before proceeding to describe the instrument, it may be well briefly to recapitulate the general principles on which the barometrical determination of altitudes depends; and for this purpose it will be necessary to refer to the mercurial Barometer, as the original source from which the graduations on the Aneroid are obtained. The reading of a mercurial Barometer, of course, represents the height of a column of mercury, which exactly balances the pressure of a similar column of the atmosphere at the station where the Barometer is situated. Hence, if we compare the reading of the Barometer at two stations of different elevations, the *difference* of the readings will give the height of mercury necessary to balance the difference of the vertical column of air at the two stations. It follows that if we know the relative weights of the air and the mercury, we can determine the height of this column of air, or in other words, the vertical height of the one station above the other. Roughly speaking, mercury is about 11,000 times heavier than the air near the earth under ordinary circumstances, so that a column of an inch of mercury will balance a column of 11,000 inches or 917 feet of air. Hence, a rough way of ascertaining the difference of elevation between two stations is to multiply the difference of the readings of the Barometer by 917, or to allow, say 9 feet for every 100th of an inch difference of reading.

The ratio of the weight of air to that of mercury is, however, by no means constant, but varies according to the pressure of the atmosphere and the temperature. Hence, though it may be sufficient for rough purposes to calculate the difference of elevation by multiplying the difference of the readings of the Barometer by a constant factor, such a method of procedure is necessarily inaccurate, and the only way of arriving at correct results is to ascertain the relative weights of the air and mercury under the precise conditions existing at the time of the observation. This is therefore the fundamental object of the various formulæ which have been proposed for barometrical measurement of altitudes, though, on account of the variable density of the air and the numerous disturbing causes which have to be taken into account, the problem cannot be stated in the simple form of mere determination of relative weight. It is, in fact, a problem which has occupied the attention of many eminent men of the past and present century, among whom may be mentioned De Luc, Shuckburgh, Laplace, Bessel, Baily, &c.

The preceding general principles apply to the Aneroid equally with the mercurial Barometer, as a good Aneroid is always graduated by direct comparison with a Standard mercurial Barometer. The only difference of importance as regards our present object is, that, whereas the readings of the mercurial Barometer are considerably affected by variations in the temperature of the mercury in the instrument, and have to be corrected for such variations, the readings of a well-constructed Aneroid are not so much affected, as it is

possible to compensate the instrument to a great extent for temperature. In the case of measurements of altitude, it is only the *difference* of the temperatures of the instrument at the various stations compared which affect the results, and this difference will be slight under the circumstances for which the improved Aneroid is designed. Taking this fact into account, as well as that of the Aneroid being compensated for temperature, we may neglect the effect of variations of temperature on the readings of the instrument. The conditions, therefore, which have to be taken into account in the present case are only those which affect the density of the air, the chief of which are—

1. The pressure of the atmosphere, which decreases as we ascend from the earth and also varies at different times.

2. The temperature of the air, which likewise generally decreases as we ascend, and which varies greatly at different times and seasons. It is this seasonal variation which chiefly concerns us, as the variation due to altitude will not be sufficient in moderate elevations to appreciably affect the result.

The first of these conditions is taken into account in the ordinary altitude scales applied to Aneroids, which are made with unequal graduations, so as to allow for the varying ratio between the pressure and the altitude.

The second of these conditions or temperature as affecting the density of the air (which must not be confounded with temperature as affecting the instrument) has, as far as I am aware, not hitherto been included in any altitude scale, and the distinguishing feature of my improved form of Aneroid is a method of adjusting the scale so as to take into account the variations of temperature.

In the determination of great altitudes, there are several other small corrections to be applied, such as those for the variation of gravity in latitude, and the effect of gravity due to increase of height, &c.; but in determinations such as those for which I have designed this instrument, the joint effect of these corrections is inappreciable.

The table that has been adopted in graduating the present Aneroid, is that given by the Astronomer Royal in the "Proceedings of the Meteorological Society," Vol. III. p. 406. The extent of the difference of this table from those of other authorities will be best seen by taking an instance. Assuming the Barometer at the lower station to be 30 inches, and at the higher one, 28 inches, and the average temperature at the stations 50° Fahrenheit, then, according to the Astronomer Royal's Table, the elevation of the one station above the other would be 1880 feet.

According to Laplace's Formulæ, as given by Guyot, the elevation would be 1873 feet.

According to Baily's Tables, as given by Guyot, the elevation would be 1878 feet.

According to Plantamour's Tables from Bessel's formula, as given by Guyot, the elevation would be 1886 feet.

From the preceding it will be seen that the Astronomer Royal's results lie between those given by the other authorities, and that the maximum difference, viz. from Laplace, is only 7 feet in 1880 feet, an amount within the limits of error of observations. With smaller altitudes the difference would be less.

I shall now proceed to describe the distinguishing features of the instrument. Aneroids with altitude scales, as hitherto constructed, consist, as far as I am aware, of only two classes, one in which the altitude scale is fixed, and the other in which it is movable at random. In the first class the altitudes are obtained by taking readings at both stations, and subtracting the reading at the lower station from that at the upper. In the second class the altitudes are ordinarily obtained by setting the zero of the movable scale at the lower station so as to correspond with the position of the hand, and taking a reading at the upper station only.

The first class of Aneroid—with a fixed scale—is accurate in principle, but the scale only allows for one of the conditions which, as we have seen, must be taken into account, viz. the varying *pressure* of the atmosphere; and the other condition or *temperature* of the atmosphere must be allowed for by calculation. It is true that by arranging the altitude scale for an average temperature, as the Astronomer Royal has done, no calculation is required for temperatures approximating to the average, and the calculation for other temperatures is greatly simplified—still calculation will be required in most cases, if as accurate results are to be obtained as the instrument is capable of giving.

The second class of Aneroid—that with a movable scale—is radically wrong in principle, as ordinarily used, inasmuch as the movable scale must be graduated for one fixed position of the zero, and when the zero is shifted at random, according to the position of the hand of the instrument, the scale necessarily becomes inaccurate.

The improved Aneroid agrees with the second class in having a movable scale, but it differs entirely from it inasmuch as this movable scale is converted from being a source of inaccuracy into a valuable aid towards accuracy. It occurred to me that the very fact of the scale becoming inaccurate for the temperature for which it was graduated, might render it practically accurate for some other temperature, so that the shifting of the scale into certain fixed positions might be made to answer the same purpose as if the original scale were altered to suit various temperatures of the air. This is the principle of the improved Aneroid, and by means of it I have succeeded in making the Aneroid give results which are practically correct for different temperatures without calculation.

The Aneroid is graduated for inches in the usual way on the face, but the graduation only extends from 31 to 27 inches, so as to preserve an open scale. The outer movable scale is graduated in feet for altitudes, and this graduation is laid down by fixing the movable scale with the zero opposite 31 inches. This is the normal position of the scale, and it is then correct for a temperature of 50°. For temperatures below 50° the zero of the scale is moved below 31 inches, for temperatures above 50° the zero of the scale is moved above 31 inches. The exact position of the scale for different temperatures has been determined partly by calculation and partly by trial, and marked by figures engraved on the outside of the Aneroid. In order to insure the altitude scale not being shifted after it has once been set in its proper position,

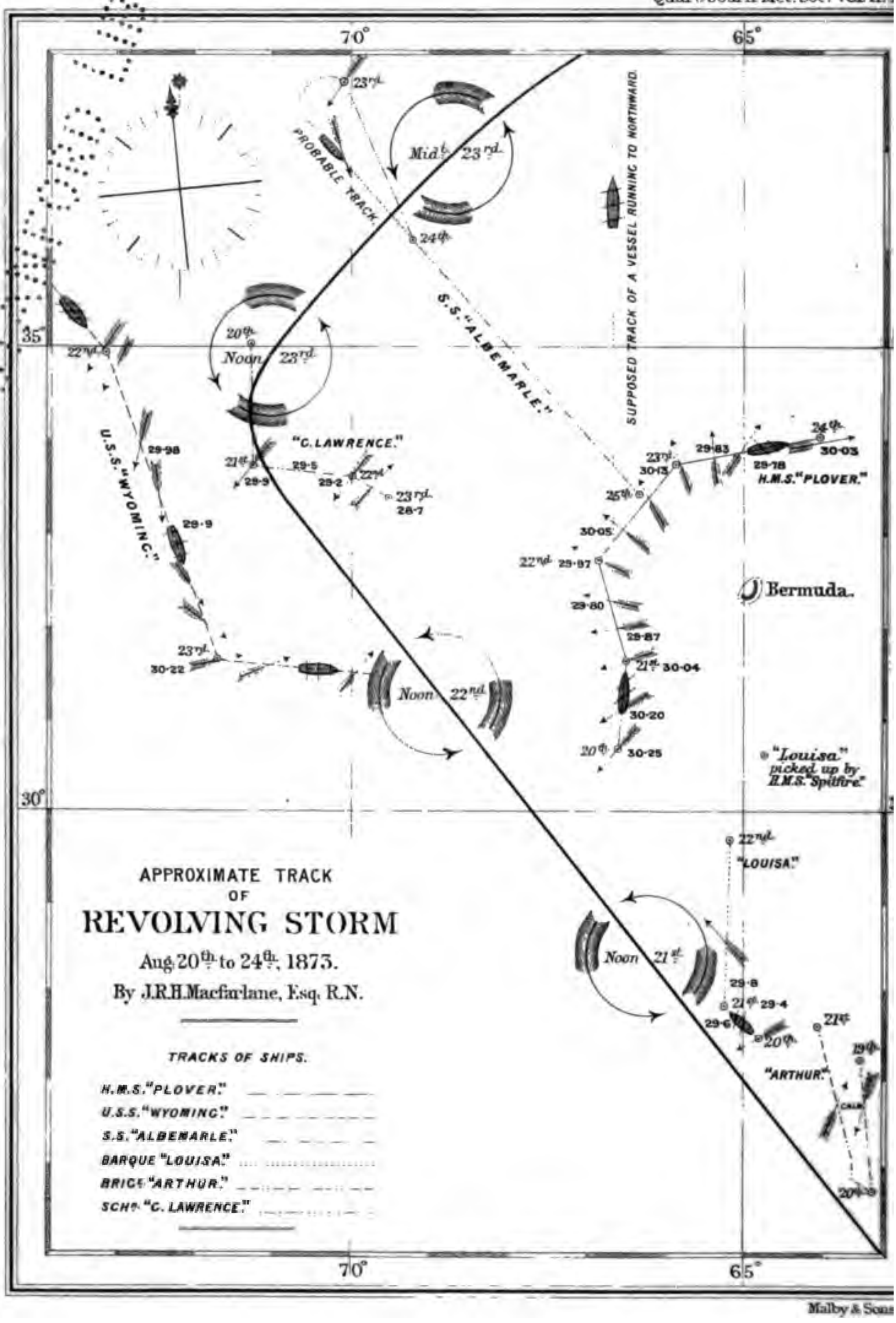
there is a simple contrivance for locking it in the various positions. This consists of a pin, which fits into a series of notches on the outside of the ring carrying the glass. By slightly raising the glass it is freed from this locking pin, and can be turned until the figures corresponding to the air temperature are opposite to the pin, when the glass should be depressed so as to re-lock it, and the scale becomes correct for that temperature. The altitudes are in all cases determined by taking two readings, one at each station, and then subtracting the reading at the lower station from that at the upper.

It will be seen from the foregoing description that the movable scale of the instrument requires to be *set* for temperatures before taking any observations, and must not be shifted during the progress of the observations. This may appear at first sight as a defect, inasmuch as the temperature of the air may alter during the progress of the observations; but practically it will not be found to be any drawback in the case of moderate altitudes, as small variations of temperature will not appreciably affect the result. A variation of 5° of temperature gives only about 1 per cent variation in the altitude, an amount that would under ordinary circumstances be inappreciable, so that as long as the temperature does not vary during the course of the observations more than 5° from that at which the instrument is set, the results may be accepted as correct, and, generally speaking, even a greater variation than this, say 6° or 8°, would be practically of no importance. Of course, if it should be found at any time that the temperature has varied considerably during the course of the observations from that at which the instrument was set, this variation can be allowed for by calculation in the usual way.

In conclusion, I would remark that the principle of allowing for variations of temperatures of the air by shifting the altitude scale does not profess to be theoretically accurate, but simply sufficiently accurate for practical purposes. In order to satisfy myself that such was the case, I have constructed true altitude scales for different temperatures by means of calculation, and compared them with the altitude scale for 50° shifted into different positions, and found that for all altitudes within the range of the instrument (say 3000 feet and under) and temperatures between 30° and 70° the maximum error from using the shifted scale, instead of the true calculated one, was only 2 feet, and the average error under 1 foot—errors which are perfectly inappreciable on the scale of the instrument. The same principle might even be applied to greater altitudes, as I find that for altitudes up to 6000 feet, and the same temperature as above, the maximum error is only 10 feet, and the average error about 3 feet, errors which would be barely appreciable on the closer scales of instruments suitable for such altitudes. For considerable elevations, however, the variation of the temperature between the base and the summit would probably interfere with the application of the principle.

The Aneroid has been constructed by Mr. Casella, of Holborn Bars, who intends in future instruments of this kind to make one or two slight modifications which I have suggested in the details.

The discussion on this Paper will be found at p. 46.



To illustrate Capt. Toynbee's Paper on the Atlantic Hurricane of August, 1873.

V. *On the Hurricane of August* 1873, *which moved in a curved track round Bermuda between the* 20*th and* 23*rd, and passed on to Nova Scotia and Cape Breton on the* 24*th, doing extreme damage both at sea and on land.* By Captain H. Toynbee, F.R.A.S., Marine Superintendent of the Meteorological Office.

[Received November 17th. Read December 17th, 1873.]

The data for the following paper are:—

1. A chart, with letter and remarks, from J. R. H. Macfarlane, Esq., R.N., Nav. Sub. Lieut. H.M.S. 'Plover,' which may be considered its groundwork.

2. Important data from H.M. Ships 'Cherub' and 'Sphinx,' with diagrams by Captain Baker, R.N., of the 'Cherub,' and Staff-Commander J. Dathan, R.N.; also a chart plotted in the Hydrographic Office of the Admiralty, showing the winds of these two ships on the 23rd August, kindly lent by Admiral Richards.

3. Extracts from the log of the 'Rozelle,' Captain Heggum, an "excellent" observer for the Meteorological Office.

4. Extracts from the 'Bermuda Royal Gazette' of September 2nd, 1873, which contains reports of several ships referred to by Mr. Macfarlane, kindly sent by General Lefroy.

5. Extracts from the 'North Sydney Herald,' Cape Breton, for August 27th, 1873, and from the 'Cape Breton Times,' of August 30th, kindly sent by Captain H. P. Wight, who has been an "excellent" observer for the Meteorological Office.

6. The velocity of the wind by the anemometer at Bermuda, erected by Admiral FitzRoy in 1859. The various directions of the wind were recorded at certain times by personal observation, the direction part of the instrument being out of order.

No corrections have been applied by me for Variation or Deviation, as it is not said whether or not they have already been applied. Fortunately, the Variation is only about half a point W in this part of the sea.

Part of the above data will now be given, followed by a few conclusions derived from a careful study of the whole.

No. 1. "H.M.S. 'Plover,'
"Bermuda, 18th Sep.

"Dear Sir,

"I send you a few remarks on the Revolving Storm which occurred this "year, and also a plan, showing its track as far as I have been able to collect "reports up to the present time.

"Although I have fewer data than I could wish, I think I have determined "the point of its curvature from the report from the 'Albemarle' (S.S.).

"The hypothesis which I have mentioned in my remarks, *i.e.* the fact of "a ship crossing the bight formed by the curvature of the storm, seems to "me to be one of great importance to the mariner navigating that particular "part to the westward and north-westward of Bermuda, where storms are "known to curve.

"Since writing those remarks, however, I see in the Meteorological Report "on Revolving Storms (I think published in 1858), that a short paragraph "alludes to the danger of crossing this bight; but as that report is probably "out of the reach of the greater number of masters of vessels (especially "American ships), it appears to me that there is no direct caution in this re- "spect in any small pamphlet on 'Rules for the avoidance of Revolving "Storms.'

"However, I simply make this suggestion, and leave it to you to consider "what it is worth. . . . . .

"Trusting you may find what I have sent of some service,

"I am,

"Yours truly,

(Signed) "J. R. H. MACFARLANE,

"Nav. Sub. Lieut. H.M.S. 'Plover.'

"To Capt. H. TOYNBEE, F.R.A.S., &c."

No. 1—*continued.*

Remarks on the Revolving Storm, August 1873.

"The path of the Storm, as shown on the accompanying plan, between "Latitudes 25° and 38° N, and Longitudes 60° and 75° W, is laid down from "the logs of six ships, viz. H.M.S. 'Plover,' U.S.S. 'Wyoming,' S.S. "'Albemarle,' Barque 'Louisa,' Brigantine 'Arthur,' and the American "Schooner 'Georgetta Lawrence.'

"1. The log of the U.S.S. 'Wyoming' shows the shifts of wind to have oc- "curred rapidly, therefore, I have considered that the storm must have passed "close to her, to make the vortex alter its bearing so quickly.

"Her barometer, however, does not fall below 29·90 in., which it is probable "it would do, considering her proximity to the vortex; and I can only account "for this from the fact that all the barometer readings entered in her log are "from an aneroid, and I believe she had no mercurial barometer on board, "in which case the readings may not be very reliable.

"2. The track of the 'Albemarle' is laid down from noon 23rd to noon "24th as a straight line, and I have added her probable track in a dotted "curved line from courses given; but, as no distances are mentioned, this is "only an approximation. She shows the curvature of the storm to the NE, "being on the NW side of it, bound to the SE, and having the wind backing "from NE to N by W.

3. The barque 'Louisa' had to cut away her lower masts, and no latitude "or longitude appears in her log after the 20th, so that her positions subse- "quent to that date are only obtained by working up the dead reckoning of "a ship nearly a wreck, which is somewhat confused. I think, however, that "the position which I have assigned to her, close to the NE of the vortex, is "nearly correct.

"4. The log of the brigantine 'Arthur' is also subject to doubt for the "same reason.

"Having no barometer, she ran into the hurricane, and had to cut away "her foremast.

"5. The schooner 'Georgetta Lawrence' has her position noted daily, as "also the state of her barometer; but there is an absence of registration of "wind, and the only conclusion which can be arrived at is, that the wind "shifted from NE to SW with a calm intervening, and that it blew very hard "from the latter quarter, which would show that she must have been very "close to the vortex of the storm.

"6. In H.M.S. 'Plover,' for nearly twenty-four hours before the storm "had any force, the wind had been increasing gradually, with a slowly falling "barometer.

"Being in the NW quadrant of the storm field, the wind remained at NE "for some hours; but at noon 21st, having hauled to E by N, there was no "longer any doubt of being in any danger from the vortex.

"Up to midnight 20th, I had scarcely supposed the gale to be of a "revolving type, as beyond a heavy swell from the SE, there was no other "indication, the sky being clear, and the barometer high (30·20 in.).

"From noon 21st the wind increased to a whole gale, blowing in gusts, "with heavy rain. At midnight the wind was easterly, and the barometer "had fallen to 29·87 in. Between 3 and 4 a.m. it was blowing its hardest, "barometer 29·80 in., which was the lowest registered, and from that time until "sunset the wind gradually decreased to a strong breeze, with a rising "barometer.

"Again, at noon 23rd, the barometer began to fall, and at sunset we were "once more under storm sails, 'lying-to.' At midnight it was blowing a "whole gale in the squalls, with heavy rain (barometer 29·78 in.), after which "time it settled at sunset into a moderate breeze, the storm then bearing "from us NNE.

"On referring to the accompanying plan, it will be seen that we were, to "a certain extent, crossing the bight which the curvature of the storm had "formed, and it would appear that to this is due the fact of our experiencing "the second increase of wind, in which case it seems that the curvature of a "storm from NW to NE might place a ship in a very dangerous position.

"For example, suppose a ship in the same position as ourselves at sunset "on the 22nd, but bound to one of the ports on the SE coast of Nova Scotia "or the Bay of Fundy (see the supposed track of a vessel on Plate I.), the "wind being a strong breeze from the SE, sea going down, and centre of "storm SW; the captain of the ship, naturally anxious to pursue his voyage "and make the most of the wind, deeming the storm to be working its way to "the NW, makes sail and keeps his ship to the northward, with a view to "nearing his port.

"Having the wind nearly aft, he may be supposed to make, in 36 hours, "about 300 miles, that is, a little over 8 knots an hour; but by this time, the "storm having curved, he would find himself in the vortex, unless a falling "barometer and increasing wind had again made him consider it prudent to

" 'lie-to;' but even then, he would have run his ship into dangero
" proximity to the storm.

" As far as at present known, two ships have foundered during the hur
" cane, and all reports agree in noticing the heavy swell from the S
" preceding it.

" I estimate its progressive movement to be from 10 to 11 miles an hour

" The fact of storms recurving is, I am aware, well known; but I ha
" never seen any caution given to mariners or directions how to act in a simil
" case to the one I have supposed, therefore, if this report be of any use
" decreasing the danger of navigating to the westward of Bermuda during t
" hurricane season, it will have accomplished the object with which it
" written.

(Signed) "J. R. H. Macfarlane,
" Nav. Sub. Lieut. H.M.S. 'Plover.

No. 2.

Report of a Hurricane experienced by H.M.G.B. 'Cherub,' on passage fro Halifax to Nassau, August 23rd, 1873, Latitude 34°50′ N, Longitu 68°31′ W, addressed to Vice-Admiral E. G. Fanshawe, C.B., by Franc C. Baker, Esq., R.N., Lieut. and Commander.

" August 22nd, at noon. Ship under port studding sails; steering SW
" 7·5 knots; wind at SE; barometer 29·95 in., but fell to 29·86 in. by 4 p.m
" Heavy sea rising from SE, with heavy banks of cloud all round the horizo
" especially in the SE quarter. Sunset awfully wild, with a pale and mis
" appearance.

" Midnight. Barometer 29·73 in.; wind SE, 7 to 8. Shortened all sail, a
" bent storm sails.

" 2.30 a.m., August 23rd. Hauled to the wind on port tack under fo
" staysail. Very heavy squalls and sea from SE.

" 4 a.m. Barometer 29·57 in.; wind SE, force 10; weather overcast, ug
" looking and squally, with rain. Very heavy sea and torrents of rain; th
" continued till noon without a shift, squalls frequently lasting for 15 minut
" with a force of 11. During the lulls struck everything possible from alo
" and prepared for the worst. Got steam ready for pumping ship out.

" Noon. Observed the first shift of wind to E by S, which proved us
" be in the left-hand hemisphere of the storm, and on the right tack. A l
" now took place till 4 p.m., with wind seldom blowing as much as force
" sun shining occasionally overhead, but the atmosphere densely thick
" round. Barometer at 3.30 p.m. 28·93 in., which proved to be the lowe
" reading.

" 4.30 p.m. barometer rose to 28·97 in., and the wind with it to force 10
" N by E.

" 5 p.m. Wind N; barometer 28·99 in.; blowing a perfect hurricane; t
" wind shrieking so as to be literally deafening; a heavy, confused sea, whi

"I can only compare to a heavy breaking surf; rain in torrents, which, with "the mass of spray blowing over us, was quite blinding. The vessel "laboured heavily at this time, the lee gunwale being sometimes completely "under water. The hands baling the water off the deck, and the engines "moving slowly ahead, kept the water under.

"This lasted till 6.30 p.m. without intermission, when the wind shifted to "NNW, force 11; barometer 29·15 in. The wind now continued in the same "quarter, and gradually decreased, with a steadily rising barometer.

"At midnight I was able to tack under steam and shape a course to the "SW, heartily glad to leave our unwelcome visitor behind us, and thankful "to an Almighty Providence for bringing us safely through.

(Signed) "FRANCIS C. BAKER,
"Lieutenant and Commander.

"'Cherub,' Nassau, Sep. 4th, 1873."

No. 3.

Extract from the log of the ship 'Rozelle,' Captain HEGGUM, from Calcutta, bound to New York.

"Noon, Friday, August 22nd, 1873. Latitude 37° 50′ N; longitude 72° "57′ W; barometer 30·241 in. (corrected 30·094 in.); air temperature 80°; wet "bulb 77°·8; sea temperature 79°·7; specific gravity 1·023; wind NE by E; "force 1; ship's head N by W; amount of cloud 2. Remark: light breeze "and fine, but a mountainous S swell, like a storm wave before a hurricane.

"Noon, Saturday, August 23rd. Latitude 38° 58′ N; longitude 73° 52′ "W; barometer 30·142 in. (corrected 30·006 in.); air 77°·1; wet bulb 75° 7; "sea temperature 77°·1; specific gravity 1·0225; wind NNE, force 2; ship's "head NW; amount of cloud 2. Remark: light and fine, but a fearfully "heavy swell from SE. Surely there must be a hurricane somewhere near, "although the sky looks very fine and light blue.

"P.M. Weather continued light and fine, but no drying in the air, things "being quite damp in the shade.*

"At 5 p.m. pilot boarded us. The sun set very, *very* red.

"At 8.30 p.m. wind freshened up in a moment from NW, force 6 to 7. "It blew some of our light sails away, coming quite without warning.

"Midnight. The wind increasing rapidly. It was NNW, force 4 to 8; "ship's head NE by E; weather clear.

"August 24th, 4 a.m.; barometer 30·084 in. (corrected 29·974 in.); air tem- "perature 67°; wet bulb 64°·6; sea temperature 72°·4; wind N by W, 8; "ship's head ENE; amount of cloud 6. Between midnight and 4 a.m. "there was a fresh gale and clear weather, with a very high and turbulent "sea. At 4 a.m. wore ship to the NW. At 8 a.m. more moderate wind, "N by E, 6. Pilot says he never saw but once such a fearful swell, which "was many years ago, just before a heavy hurricane in New York.

* This was on the edge of colder water; it was down to 74°·2 at midnight.

"Noon. Latitude 39° 14′ N; longitude 76° 16′ W; Absecombe Light-" house NW by N 9 miles; barometer 30·215 in. (corrected 30·111 in.); air" temperature 66°·2; wet bulb 60°·2; sea temperature 70°·4; specific gravity" 1·0223; wind NW by N, force 8; ship's head NE by N; amount of cloud" 2. Remark: Moderating fast; ship beating to windward.

"4 p.m. Freshening NW by N breeze, and clear; sea going down" fast.

"8 p.m. Wind NW by N, force 6; clear weather; Barnegat west" 18 miles. The wind continued NW with no clouds until 8 a.m. of the" next day (25th), when the record ceases. At 2 p.m. 25th she arrived at" New York."

On arriving Captain Heggum heard of the hurricane on the coast of Nova Scotia, and adds, "Many ships arriving here have been in some part of it;" some are dismasted, and others have suffered damage. Hence that fearful" swell which we had on the 22nd to the 24th. The ship 'Bengal,' Captain" Wm. Code, arrived here on the 7th of September from Calcutta; he had a" gale with a fearful sea over 200 miles south of Bermuda, and stood to the" SE on the starboard tack, until he got into fine weather."

No. 4.

Extracts from the 'Bermuda Royal Gazette,' of September 2nd, 1873.

"We have been obligingly favoured by Captain Stark, of the New York" Mail Steamer, 'Albemarle,' with the following extract from the log book" respecting one of the gales which recently passed in our neighbourhood," and in which several vessels, whose reports will be found below, suffered" severely, and one foundered. Doubtless, we shall hear from other" sufferers.

"Thursday, August 21st. At 4 p.m. left New York with light rains till" 8 p.m., and then thick fog till midnight. Barometer 29·98 in.

"Friday, August 22nd, a.m. Calm and clear; barometer 29·98 in.; light" airs from ESE, and considerable swell from S, both increasing, and with" falling barometer till midnight, when blowing hard, with heavy swell from" SE.

"Saturday, August 23rd, a.m. Barometer 29·80 in., wind and sea increas-" ing, more threatening weather, and barometer falling gradually. Every indi-" cation of being in contact with outer edge of an impending cyclone. At" 6.45 a.m. hove to on starboard tack to carefully determine bearing of" centre and track of this cyclone. At 8.45 a.m., having been hove to for" two hours, finding wind *not to veer at all*, the ship consequently being on" or about the prolongation of the track of the advancing storm centre, and" the barometer fallen to 29·68 in., ran the ship off with wind a little on the" starboard quarter, steering NW by W till noon, barometer rising gradually" to 29·80 in., sea and wind moderating, and squalls less frequent. Latitude" 37° 40′ N; longitude 70° 6′ W.

"P.M. From noon to midnight barometer remained the same. As the

"wind veered to *left*, or northward, steered WNW, W, WSW, SW, and S "at midnight, when the wind was N by W, more moderate, without squalls, "and weather clearing.

"Sunday, August 24th. At 1 a.m. brought ship to head her former "course, SSE ¼ E. Weather moderating and barometer rising very gradually "during the day. Swell still heavy from NE. At noon, latitude 36° 4′ N; "longitude 69° 11′ W.

"Monday, August 25th. Commences with moderate breezes and clear "weather; barometer 29·88 in. At noon latitude 33° 24′ N; longitude 66° "32′ W.

"At 10 p.m. made Bermuda Light. Ends with light airs, calms, and "very clear and pleasant weather, with moderate swell from NE.

"Tuesday, August 26th. At 6 a.m. (having awaited daylight for several "hours off St. David's Head), reached the Quarantine Station off Hamilton "to await health officer, having on board the officers and crew, 19 in all, of "the English ship 'Assam Valley,' which vessel was lost during the cyclone."

Ship 'Assam Valley,' foundered.

"Captain George N. Daken, of the late ship 'Assam Valley,' of St. John, "N.B., of 1,100 tons, built in 1854, from Pensacola, timber laden, out "28 days, bound to Liverpool, reports that at noon on Thursday, 21st "August (civil time), in latitude 34° 24′ N, longitude 67° 40′ W, moderate "breezes from ESE, the sky overcast; took in all light sail. 9 p.m. A heavy "sea running from SE; made preparations for a gale, which came on at "midnight.

"Friday, August 22nd. At 6 a.m. hove-to on port tack under lower main "top-sail, mizen spencer, and fore-top mast staysail.

"8 a.m. Heavy sea running; ship labouring heavily, and shipping large "quantities of water on after main deck.

"Noon. Weather about the same. 1.30 p.m.: Ship fell off in the trough "of the sea, starting deck load on lee side, and smashing the bulwarks. "Sounded the pumps, and found 2 feet 3 inches of water in weather side. "All hands called, and both pumps set on.

"8 p.m. All hands still at the pumps, with the exception of two at the "wheel. The tiller broke just at the back of the rudder; had to leave "pumps to secure rudder, which was accomplished. At 10 p.m. again at "the pumps; the deck load of timber on the lee side was knocking about "and endangering the life of any one who attempted to go near it, whilst the "timber on the weather side started and came down on the pump handles, "and prevented our working them; wind increasing to a hurricane. About "midnight the captain thought it advisable to wear the ship, though she "headed the sea best on the port tack; failed in doing so.

"Saturday, August 23rd. 1 a.m.: wind at SW; all went aft to alter the "position of the helm, and whilst doing so, the deck load on the lee side "floated, and falling against the stanchions, opened the ship, and caused

" her to fill with water in about half an hour. She then made a heavy lee " lurch, and turned over on her broadside, giving those on deck barely time " to get on her side. The steward, name not known, who was in the cabin " at the time, was drowned. The sea then made a complete breach over " her. The mizen topmast backstay was cut away, and in half an hour " the vessel righted, with the loss of fore topmast, main mast, and mizen " mast, and decks swept fore and aft.

" Sunday morning, 24th August, set in with clear blue sky, wind SW, and " more moderate weather. We were able to get up on the forecastle, and " get some warmth from the sun. We erected a flag-staff, and with a large " muffler placed it on the foremast head. About 4 p.m. 'Sail ho' was most " joyfully reported from the foremast head, and on our weather bow; bearing " down on us. About 5.20 the schooner 'Robert Myhan,' Captain Harvey " C. Phillips, came alongside and spoke to us."

The crew were taken on board the 'Robert Myhan' after some difficulty, and eventually put on board the S.S. 'Albemarle.'

" British Barque 'Louisa,' dismasted.

" British barque Louisa, of Bristol, 416 tons register, R. G. Pomeroy, " master, from Demerara, bound to Bristol, with a cargo of sugar and rum, " arrived here (Bermuda) on Sunday last dismasted. She left Demerara on " Sunday, August 10th. Nothing of note occurred till Wednesday 20th (civil " time), when in latitude 27°30′ N., longitude 64°50′ W., wind ENE., heavy " swell from SE. Wind increased to hard gale, all sail was stowed and well " secured with exception of two close-reefed topsails and mizen staysail. At " 2 p.m., barometer 29·80 in., mizen staysail blew away; set another; 4 p.m., " fore-topsail blew away. 6 p.m., barometer 29·60 in., main-topsail blew away; " ship lying-to on starboard tack, under mizen staysail; wind steady at " ENE., but increasing to a hurricane in its fury. At 8 p.m., mizen stay- " sail blew from hanks and halyards; got it down; top-gallant mast and jib- " boom blew away. Gusts most awful, half the crew lashed to the pumps, " the rest could only move about on hands and knees; barometer 29·40 in.

" August 21st, 1 a.m. Lull for 10 minutes, when wind shifted to SSE. " Tried to re-bend mizen staysail, but could not; put clothes in the rigging; " ship lying-to under them, but heading into a frightful sea. 2 a.m.: two " seas, in quick succession, broke on board, sweeping decks, splitting cover- " ing boards, water ways, broke stanchions and stove in main-hatch; long " boat and pinnace gone. Hurricane intense, hard at work securing main- " hatch, spars and stanchions, sails blew clear out of the gaskets; hurricane " awful, barometer 29·40 in. Noon: wind still blowing in all its fury, half of " the crew lashed to the pumps, remainder moving only on hands and knees; " found four feet of water in hold, ship straining fearfully, wind howling, " water in hold increasing, barometer 29·50 in.

" 9 p.m.: set mizen staysail, bent fore-top mast staysail.

" 10 p.m.: six feet water in hold, barometer 29·60 in.; heavy cross seas, " pumps heaving well, but water still gaining.

"August 22nd, 4 a.m. Got ship before the wind, and kept away for Bermuda. Pumps constantly going, wind SSE; weather moderating, set main-sail; ship fast settling to port and forward; hove all aback, cut away fore and main masts, and all attached.

"Noon: wind S, weather moderate, pumping for dear life. 4 p.m.: ship like a log on the water. 10 p.m.: ship settling down to starboard. Midnight: weather moderate, light wind.

"August 23rd, 4 a.m. Wind WSW., water gaining one inch (no time given), pumps still hard at work, some hands constructing a raft.

"Noon: wind WNW, and fair, smooth water, but still gaining. Ship right on beam ends, tried to jettyson some of the top tier of cargo, but found on clearing one that the weather casks would come over, threw everything off deck that was cumbrous. Midnight: fine, crew very exhausted, being at pumps for 60 hours; ship commenced to lighten up fast, but still on beam ends; pumped sugar from hold; launched raft, moored her off, with sea anchor, and put two hands in her.

"Tuesday, August 26th, noon. Wind W, light, latitude 30° 21′ N, longitude 65°32′ W; finding no probability of ship fetching Bermuda under her jury masts, sent the only boat away with first mate and three hands, with instructions to steer N by E, 115 miles, for Bermuda, to solicit assistance to save life and property. May God in his mercy give them a safe passage. 8 p.m.: heavy rain squall (poor little boat).

"Nothing of particular note occurred till Friday, August 29th, when, in latitude 30° 37′ N, longitude 64° 53′ W, at 5 p.m., a steamer hove in sight, and at sunset we were taken in tow by H.M.S. 'Spitfire,' and safely brought to an anchorage in Hamilton Harbour, Bermuda, on Sunday 31st, at noon."

"The brigantine 'Arthur,' of and from Yarmouth, Nova Scotia, Capt. C. W. Carty, bound to Porto Rica, out 20 days, with a cargo of fish and lumber, was towed into this port, on Sunday last, by the steamer 'Clover,' with loss of foremast and all attached, deck load of lumber, and two casks water. The Captain reports that nothing particular occurred till the 20th of August. He was then in latitude 25°45′ N, longitude 63°20′ W, wind E, attended with heavy seas from the SE. At 8 p.m., wind hauling to NNE. At midnight, wind still increasing. Having taken in all sail, ran with everything furled.

"August 21st, 4 a.m. Wind had increased to a hurricane, still from NNE. The ship not answering her helm, broached to on port tack, and was thrown on her beam ends. Finding at the end of fifteen minutes that she was going further over, cut away foremasts, which with all attached went over the side; the vessel, thus relieved, soon righted. At 5 a.m., wind still increasing. At 5.30 a.m.: moderated a little. 7 a.m.: quite moderate. Set storm sail to endeavour to bring her head to the sea; ship lying broadside on, and rolling heavily; cut away the wreck of the foremast to prevent the yards, &c., from damaging the hull, it being impossible to

" secure them. Ship laboured heavily, shipping large quantities of water and
" leaking badly. At 8 a.m. wind veered to SSW. At 10*: wind increas-
" ing. At 11*: took in storm sail. At midnight 21st, it blew a terrifi
" hurricane, which continued till 4 p.m. of the 22nd, when it began to moder-
" ate; heavy sea running, set storm sail.

" At 12, in latitude 25°4′ N, longitude 63°44′ W, Bermuda being th
" nearest land, set all available sail and anchored, at the west end of th
" Island, on Saturday the 30th, to await assistance, and was towed int
" Hamilton Harbour on the 31st, by the tug steamer, 'Clover.' "

" Schooner 'Georgetta Lawrence,' Captain Robinson, out 14 days, from
" Baltimore, with coal for Government, arrived at the Dockyard on Saturday
" last, August 30th. The Captain reports having had severe weather th
" entire passage."

" Report of Captain Doe, of steam tug, 'Clover,' from Wilmington, Dela-
" ware (39°43′ N, 75°40′ W), to Bermuda:—Left the Breakwater at 9 p.m
" on 21st. Wind at the time SW. At midnight the wind backed to SE
" and continued to back till Saturday night, when it was at ENE. At mid-
" night on Saturday 23rd it blew very heavy, the wind continuing to back t
" NW, when weather began to moderate. At noon on Sunday 24th, weathe
" more favourable. The weather became fine on Monday, the wind continuing
" from the NW."

No. 5.

Remarks extracted from the 'North Sydney Herald,' Cape Breton, for Augus 27th, 1873.

" The greatest gale experienced since 1810 swept over the Island of Cap
" Breton on Sunday last.

" Our usual November winds and waves have not equalled, this century a
" least, the terrific, magnificent yet awful blast.

* Between 4 a.m., August 21st, and midnight, when it blew a terrific hurricane, th hours are not said to be a.m. or p.m.; but the Bermuda 'Royal Gazette,' of Octobe 14th, refers again to the log of the 'Arthur,' and it is there shown that they were a.m hours of the 21st, up to 8 a.m., when the wind changed suddenly from NNE. to SSW That paper then goes on to say that, after the shift of wind, " the ship was run unde storm staysails to the NW, *i.e.* towards the centre of the storm, and accordingly w cannot be surprised that after holding this course until midnight 21st, it again blew terrific hurricane, this time from SSW, tending to S., the centre being to the wes of her. About 4 a.m. the wind moderated, and got round to SSE at noon of th 22nd." From this quotation we may conclude that the 10 and 11, when "the win was increasing, and storm-sail was taken in," were p.m. hours of the 21st. The above named paper gives the following as the probable positions of the 'Arthur,' though thinks the longitudes doubtful:—

20th	Noon	25°45′ N.	63°20′ W.	Wind,	East.
„	Midnight	24°32′ N.	63°33′ W.	„	NNE.
21st	Noon	24°6′ N.	63°47′ W.	„	SSW.
„	Midnight	25°30′ N.	64°30′ W.	„	SSW.
22nd	Noon	27°4′ N.	63°44′ W.	„	SSE.

"The weather on Sunday morning the 24th was dull and heavy. At noon "the rain was falling fast, the barometer standing at 29·8 in. The wind "commenced to blow from the SE, increasing from a strong breeze at 1 "p.m. to a gale at 6 p.m., this rapidly changing (with heavy showers of rain, "and the wind at the same time becoming more easterly) to a perfect hurri- "cane by midnight; the barometer reading 29·0 in.

"About 1 a.m. of the 25th, the storm commenced to moderate, and for the "next twelve hours was a heavy gale, the wind NE, but the storm neither "so intense, nor the wind so swift, as during the night.

"The harbour, which we had fondly imagined so land-locked that no wind "or sea could disturb us, contains to-day the wrecks of 25 ships.

"Travelling is stopped on account of broken-down bridges; between this "and Sydney three or four are destroyed.

"The crops throughout the country are damaged most fatally."

No. 5 *continued.*

Remarks extracted from the "Cape Breton Times," Sydney, Aug. 30th, 1873.

"We regret to have to chronicle the heaviest gale within our recollection "on our coast. On Sunday last, August 24th, about noon, the wind "was blowing from SE, and gradually increased by dark to a gale. It was "then blowing from the NE, and was of tremendous force. Its average "speed between 8 p.m. of Sunday and 6 a.m. of Monday was 45 miles per "hour, according to Mr. Hill's anemometer, but a couple of hours later it "rose to 60 miles.

"During Monday the storm abated considerably, but near dark it again "sprang up from the NW, and although not equalling in force that of the "preceding night, still it, in many instances, utterly finished the destruction "commenced the previous night.

"The steeple of a church, several barns, out-houses and trees were blown "down."

No. 6.

Velocity of wind in miles per hour from the Bermuda Anemometer, and its direction at certain hours, from personal observation, between noon of August 21st and midnight of August 25th, 1873. (See next page.)

A careful consideration of the above data leads to the supposition that Mr. Macfarlane's plan (see Plate I.) gives a very fair idea of the track of the storm.

The data from the 'Cherub' and 'Sphinx' lead to the supposition that at noon of the 23rd the centre of the cyclone was about 150 miles to the SE of the position given to it by Mr. Macfarlane.

The extracts from the log of the 'Rozelle' show that she was probably about 300 miles to the NW of the centre at noon of the 23rd, so that if it had continued its NW course it would have passed over her; but as it then recurved to the NE, she only got the SE swell from the wind of that part of the cyclone which was blowing towards her, whilst her strongest wind was NW; hence it may be concluded that the direction of the swell which overruns

	Aug. 21st.		Aug. 22nd.		Aug. 23rd.		Aug. 24th.		Aug. 25th.		
Hour.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Hour.
1 am.	Instrument under repair.		33		27		30		14		1 a.m
2 ,,			33		24		29		13		2 ,,
3 ,,			32		24		29		12		3 ,,
4 ,,			34		24		31		12	N.W.	4 ,,
5 ,,			31		20		31		13		5 ,,
6 ,,			30		24		32		14		6 ,,
7 ,,			28		20		29		14		7 ,,
8 ,,			24	S.E.	24	S.E.	29		10		8 ,,
9 ,,			25		26		25		11	N.W.	9 ,,
10 ,,			26		26		29	S.W.	12		10 ,,
11 ,,			27		24		22		12		11 ,,
Noon.			23		28		24		10		Noon
1 p.m.			27		30		20		10		1 p.m.
2 ,,	28		26		30		20		10		2 ,,
3 ,,	29		25		28		19		9		3 ,,
4 ,,	29	E.	26		30		19'		10	N.W.	4 ,,
5 ,,	29		24	S.E.	28	S.	19	W.	8		5 ,,
6 ,,	29		25		31		19		7		6 ,,
7 ,,	28		26		35		19		9		7 ,,
8 ,,	27		25		32		18		7		8 ,,
9 ,,	29		26		35		17		7		9 ,,
10 ,,	28		24		35		15		7		10 ,,
11 ,,	27		26		30		15		4		11 ,,
Midnight	28		24		35		14		5		Midnight
TOTALS..	311		650		670		554		240		TOTALS

a wind roughly indicates the bearing of the cyclone, but not necessarily the direction of the wind coming to the ship which experiences it. This has been frequently noticed.

The extracts from the Cape Breton papers do not agree as to when the wind changed to NE, but they roughly indicate that the centre was to the S of their ports about midnight of the 24th. This seems to show that, after recurving on the 23rd, the hurricane travelled to the NE at a speed of 18 or 20 miles an hour. In No. 13 of the publications of the Meteorological Office it is shown that the winter cyclones, which originate over the Gulf Stream, sometimes seem to pass to the NE at a speed of 30 miles an hour.

The extracts from the 'Bermuda Royal Gazette' differ from Mr. Macfarlane's chart as to the track of the brigantine 'Arthur.' If the 19th were left out and the track were of the same shape, but starting to the S from her position on the 20th, it would better agree with the newspaper report; but it is probable that Mr. Macfarlane had the log, so no alteration has been made.

Unfortunately, the direction part of the Bermuda Anemometer was out of order, so that the direction was not continuously recorded. The two strongest winds were, 1st SE (say ESE), between midnight and 4 a.m. of the 22nd when it attained an average speed of 34 miles for one hour; and 2nd, between S and SW (say SSW), between 6 p.m. and midnight of the 23rd, when it attained an average speed of 35 miles for four out of the six hours. (See the Table of Speed already given.)

It is interesting to notice that the remarks on the winds experienced by the 'Plover' show that she also had her strongest winds at these times, and the directions seem to have been very similar. The 'Plover' had her lowest barometer (29·80 in.) and hardest blow between 3 and 4 a.m. of the 22nd; this is the very hour during which Bermuda had the strongest SE wind, and from this time both had less wind. Then at noon of the 23rd the 'Plover's' barometer commenced to fall again, and at sunset she was once more under storm staysails; at midnight it was blowing a whole gale from the SW, after which it moderated. The above table shows that Bermuda was similarly affected.

We can hardly suppose that the hurricane dipped to the S, so as to bring its centre nearer to the 'Plover' and Bermuda; for although the 'Plover' had made a NE course, and might have slightly closed with the cyclone, Bermuda had not changed its position; hence it seems probable that the isobars which run round the centre of a cyclone may not be quite circular, and that the gradients may not be the same, nor the winds of equal strength, at the same distance from its centre; though for general rules they may perhaps be considered to be so.

We have, then, very good proof that this was a hurricane which probably originated in the tropics, and first travelled to the NW and then to the NE.

If the circular theory of hurricanes were proved to be true, and, with the wind on one's back, the centre were always to the left in the Northern Hemisphere, then little more could be done; though it would certainly be very satisfactory to discover where this very severe cyclone originated, and where it broke up.

But if Mr. Meldrum's theory as to the shape of Mauritius cyclones be correct,—and it certainly seems to be supported by the facts he gives,*—then in Mauritius cyclones the wind frequently blows directly towards their centres, and if in these, why not, also, in those of the Northern Hemisphere? Such a doubt ought to be set at rest; but to do this, a large number of good observations are required, extending far beyond the cyclone on all its sides; from these synoptic charts should be constructed, showing the data for a given hour each day, and in important cases more frequently.

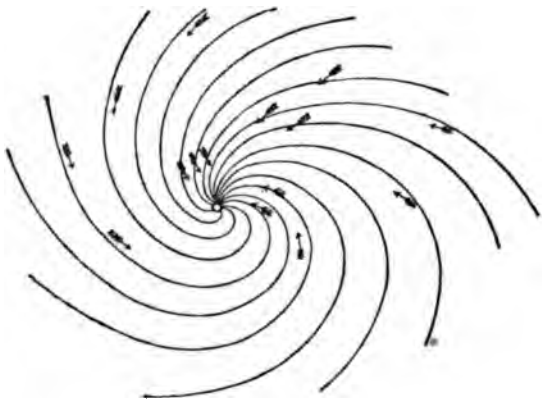
Diagram I. (p. 28) is a reversal of one of Mr. Meldrum's diagrams, to adapt it to the Northern Hemisphere. If the air in our cyclones have such a motion, it is quite plain that our rules for avoiding their centres need to be greatly modified, for in some cases the wind is shown to be blowing directly towards the centre; and the changes in direction are much more rapid in some parts of the compass than in others, so that even though the wind is blowing from all points of the compass in different parts of a cyclone at the same time, there is great danger in considering it as nearly circular in its motion.†

* His paper has been republished by the Meteorological Office.

† Perhaps Diagram I. viewed *directly*, may better represent the cyclonic winds of high N. latitudes, where the prevailing winds are W; whilst when *reversed* it may be more like the motion of air in the tropical cyclones of the Northern Hemisphere, where the prevailing winds are E. These are questions which meteorologists have still to answer.

A reference to Plate I. shows that it does not quite support the ci
theory. For instance, supposing that theory to be true, at noon of the
the 'Wyoming,' having the wind WSW, places the centre of the cyclo

DIAGRAM 1.



the NNW of her; whilst the 'Albemarle,' having the wind NE, p
the centre to the SE of her. Again, the 'Plover,' having the wind
places the centre to the SW of her. Now it is quite clear that these cross
ings could not meet; for instance, one ship places the centre to the
72° W, whilst another places it to the E of 70° W. On the chart the c
of the cyclone is represented as being about WNW of the 'Plover' at
of the 23rd, when her wind was SE, but according to the circular the
ought to have been to the SW of her. At the same time the 'Albemarl
the wind NE, with the centre about SSW, instead of its being to th
of her. These cases show the great difficulty of reconciling facts to
theory. Curiously, the supposed shape of a Northern Hemisphere cy
given on Diagram I., does place the centre WNW, when the wind is
and, again, the centre SW with the wind NE. Then again, the long
tinuance of NW winds experienced by the steam-tug 'Clover' after
night of the 23rd, and by Bermuda on the 25th, seem to support the
that the winds of Northern Hemisphere cyclones may blow in somewh
same way as is represented by the accompanying reversal of Mr. Meld
Southern Hemisphere diagram.

In conclusion, let us hope that the importance of the subject will lead
thorough discussion of this gale; and I would have navigators to notice
very important it is that careful observations of the wind's direction and
should be given, as well as *the hours when they change*. Careful baro
observations from standard instruments are also indispensable, before
really good results can be worked out.

The discussion on this Paper will be found at p. 47.

VI. *On a Mercurial Barometer, for the use of Travellers, filled by the Spiral-Cord Method.* By Staff-Com. C. George, R.N.

[Received November 19. Read December 17, 1873.]

In order to help the traveller to a Mercurial Barometer, I have carefully examined the different methods of filling the tubes of Barometers, as recommended by experienced and practical men; and it appears there are two ways of performing the operation, which may be called the hot and cold processes.

The hot process, as concerns the traveller, may be dismissed as being too uncertain; and therefore I directed my whole attention to the cold process, as most likely to lead to a favorable result.

Numerous experiments were tried and abandoned, as unsatisfactory, besides being out of the reach of the traveller, whose convenience I was solely considering. The following method I have adopted to fill the barometer tube with pure mercury, and obtain the requisite vacuum: merely premising that the spiral-cord has the effect of breaking up the mercury into globules and releasing the air, which was formerly effected by heat. I have named it the "*Spiral-Cord* method" from the form of the material used.

The chief points are:—

1. The spiral-cord being kept inside the tube while filling.
2. Using the cistern as a funnel.
3. The circular motion given to the spiral-cord, which, acting on the dense body of mercury, forces the cord upwards and out of the mercury, and with it the air bubbles, &c.
4. Vulcanized india-rubber stoppers for the cistern, instead of cork, which will not stand the mercurial pressure.

Description of the Barometer.

Diagram I. shows the Barometer set up in the tripod stand, in which the following may be briefly noticed:—

A B C is the tripod stand, which forms the outer case when packed for travelling.

1. Is the tube.
2. The upper stopper, through which the Barometer tube passes into the cistern.
3. The cistern.
4. The lower stopper, on which the Barometer rests, is supported upon a temporary tripod stand, or a large stone, block of wood, or box about 1 or 2 feet from the ground, to suit the height of the observer.
5. A wood or ivory disc placed between 2 and 3, it rests upon the cistern, and the upper stopper and tube thus bear fairly and equally on the disc.
6. A brass or zinc case to receive tube, cistern, stoppers, and spiral-cord (diagram 2).

A full description of each part follows:—

The Stands.

No. 1 stand is of the tripod form, which when shut up has the zinc case inside it, contains the Barometer tube, cistern, stoppers, and spiral-cord, &c., is easily carried, and the Barometer is well protected from accident.

DIAGRAM No. 1.

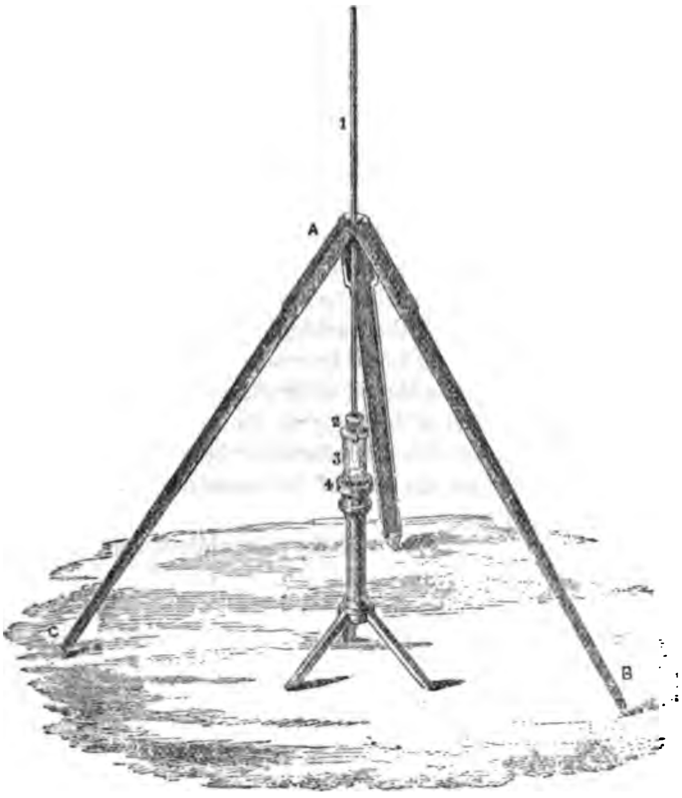
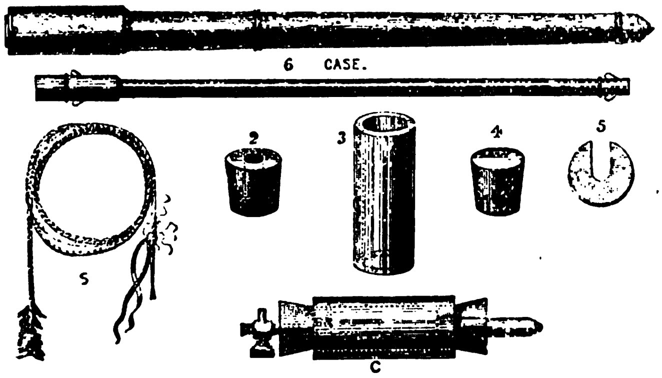


DIAGRAM No. 2.

BAROMETER PACKED FOR TRAVELLING.



No. 2 stand consists of a plain strip of wood, 3½ feet long by 3 broad, has two small tables which shut up on hinges, and by a butto toned flat to the surface of the stand: the upper table has a hole in it to ı the tube when being filled.

On the lower table the Barometer rests for observation; the stand has a brass bracket at one end, by which it can be hung to a tree or post, and thus placed perpendicular.

No. 3 stand is formed by screwing a long sharp gimlet into a tree or post, a ring is fastened to the gimlet, which receives the Barometer tube and keeps it steady.

DIAGRAM No. 2.—No. 1.—THE TUBE.

The tube is 34 inches long and 0·5 inch in diameter, the bore 0·25 inch, and the walls of the tube ⅛ inch in thickness.

The tube is graduated by the maker as follows:—at ½ inch from the open end is the commencement of the scale of the Barometer, it is graduated upwards 1½ inch, and divided first into 0·1 inch, and these again are quartered, so that it can be read off by the graduations to 0·025, 0·050, and 0·075 of an inch, and can therefore be easily estimated to 0·01 inch.

The next mark is at 15 inches from the zero, which determines the height of 18,000 feet, or 180° of the boiling point: from 15 to 32 inches the small graduations recommence the same as at zero, so that a comparison of the levels of the mercury is read off to 0·01 inch.

NOS. 2 AND 4.—THE STOPPERS

Are of vulcanized india-rubber, in length 1·2 inch, size of large end 1·3 inch, size of small end 1·15 inch; they are warranted to stand a temperature of 32°, they will also bear the heat of the tropics; especially as the temperature of elevations is much below 60°.

No. 3.—THE CISTERN.

The cistern is of glass, 3½ inches in length, 1·25 inch in the bore; wall of the cistern 0·1 inch; the centre lengthways is marked by a scratch.

No. 5.—THE DISC

Is a round piece of wood or ivory ½ of an inch larger in diameter than the cistern, on which it rests, and is 0·15 in thickness; a round hole is cut out of the centre, a trifle larger than the diameter of the tube; another piece is also cut out from the inner circle or hole, towards the outer edge of the disc; this enables it to pass clear of the tube, and lays flat on the top of the cistern; the upper stopper and the tube rest on this disc with a fair and equal bearing.

No. 6.—BRASS OR ZINC CASE.

This case receives the tube, cistern, stoppers and spiral-cord, ready for use; it is lined with a soft padding to protect the tube and prevent breakage; each end has a clamp-like fastening, which can be tied with a string. This case and its contents are then stowed inside the tripod stand, and thus secured while travelling.

THE MERCURY.

It is absolutely necessary to have the purest mercury that can be purchased, as the integrity of the observations mainly depends on its having no

alloy whatever; no filtering process will rectify bad mercury. Just before filling the tubes, it will be found a good practice to force the mercury through a clean silk pocket handkerchief, (doubled) by screwing up the corners, &c., until all has passed through; it may then be poured into the iron filterer, and is ready for use.

It must be poured from the filterer down the bore of the tube, and any quantity of mercury that does not pass into the orifice will be saved in the cistern.

ARTICLES USED IN FILLING THE TUBES.

B.—THE SPIRAL CORD (DIAGRAM 2)

Is made of catgut, twisted, and performs a very important part, not only in filling the tube but in cleaning it out. At one end is attached a small strip of calico, which is tied fast and well secured; this is passed down the tube to clean it out: at the other end of this cord is fastened the upper part of a crow's feather, which is passed down the tube after being cleaned out, and remains there while the tube is being filled.

C.—THE FILTERER.

The filterer is of iron, and is stowed in a wooden case, which serves for a trough to receive the mercury from the Barometer when about to be packed away, and from thence the mercury is poured into the filterer, which is flat and oblong, fitted with two screw plugs; one of these being removed, into its place is screwed a nipple, with a very fine hole, through which the mercury is filtered into the orifice of the Barometer tube when being filled; the other plug on being removed, into its place is screwed a small funnel to convey the mercury from the trough back into the filterer.

THE PLUMB-LINE

Is attached to the end of a piece of wire, the other end secured to a small cork that fits into the upper aperture of one of the spare stoppers; this stopper, with plumb-line, &c., fits to the upper end of the barometer, and can be moved round so as to test its being perpendicular, at right angles.

COMPARISONS.

Meteorological Office, 116 Victoria Street, London, S.W.,
8 *March*, 1873.

Dear Sir,—The experimental Barometer which you fitted in my room on the 21st ultimo has been read frequently since that time, and I enclose you a copy of the results of its comparison with one of our Barometers.

The figures appear to be fairly satisfactory, the mean difference being less than 0·03 inch.

From the theoretical reasoning I should have expected that it would read lower than the standard; possibly the fact of the correction lying in the opposite direction may arise from an error in the graduation of the tube.

It is evident that the vacuum is good, and this seems a sufficient proof that your method of filling the tube is effectual in removing the air bubbles.

Yours faithfully,

ROBERT H. SCOTT, *Director*.

To COMDR. C. GEORGE.

Meteorological Office, 116 Victoria Street,
8 *March*, 1873.

Comparison of Comdr. C. GEORGE's Experimental Barometer B 4, graduated on the glass tube itself, with Barometer B.T. 48, which has no instrumental error.

Date—1873.			Barometer B.T. 48.			Experimental Barometer B 4.		
			Observed Reading.	Therm.	Reduced to 32°.	Observed Reading.	Reduced to 32°.	Error of Indication
M.	D.	H.	in.	°	in.	in.	in.	in.
Feb.	21	4	30·222	39	30·194	30·24	30·216	—0·022
"	"	22½	29·904	38	29·878	29·93	29·910	—0·032
"	23	22½	·786	38	·760	·82	·800	—0·040
"	24	4	·806	42	·770	·85	·817	—0·047
"	"	22½	·664	38	·638	·68	·660	—0·022
"	25	4	·534	42	·498	·55	·517	—0 019
"	"	22½	28·940	44	28·900	28 97	28·931	—0·031
"	26	5	·894	46	·849	·92	·876	—0·027
"	"	22½	29·388	45	29·344	29·41	29·369	—0·025
"	27	4½	·546	46	·500	·56	·516	—0·016
"	"	22½	·750	43	·712	·78	·745	—0·033
"	28	4	·814	45	·770	·84	·799	—0·029
"	"	22½	·354	42	·318	·37	·337	—0·019

13/ 0·362

Mean.......... 0·028

R. STRACHAN.

1873—3—1.

Range of Barometer...1·828 in.

METEOROLOGICAL OFFICE.

Result of the Examination of Barometer B4.

1st Filling—13 Observations, mean error ....0·028 in.

Error submitted by C. G. $\left\{\begin{array}{l}\text{of Graduation...0·08 in.}-\\\text{Bore, 0·23 in....0·05 in.}+\end{array}\right\}$ ....0·080 in.

C. G.

Kew Observatory, Richmond, Surrey, S.W.,
May 23, 1873.

Capt. C. GEORGE, R.N., 1 Savile-row.

My dear Sir,— Replying to your statement, in reference to your Barometer, that you are waiting results, I enclose copy of the comparisons made with our standard, since your last refilling the tube.

You will see there is a small difference of about 0·02 in. to the correction before found.

Its behaviour for the short time since you were here (May 16th) seems good, and, if you please, you may at any time come and try one more re-filling to prove its regularity of action; after that I would suggest your sending the instrument for a practical test up some elevation, by which its readings may be compared with some other good mountain barometer.

I remain, yours faithfully,

SAMUEL JEFFERY,

Superintendent.

KEW OBSERVATORY.

Result of the Examination of Barometer B 6.

1st Filling	—20 Obsns.	at 30 in.	gave as the Residual Inst. Error	...0·08 in.+
,,	,,	,, 29·5	,, ,, ,, ,,	...0·07 in.+
2nd ,,	8	,, 30·0	,, ,, ,, ,,	...0·06 in.+
,,	,,	,, 29·5	,, ,, ,, ,,	...0·05 in.+
3rd ,,	26	,, 29·5 to 30	,, ,, ,,	...0·081 in.+

Error marked on the instrument before testing...............0·08 in.

C. G.

DIRECTIONS FOR FILLING THE BAROMETER TUBES.

1. A piece of glazed calico, about a yard square or more, should be spread out smoothly on the table or floor, the glazed side uppermost, to catch the mercury that may be spilled in practising the operation of filling, and to receive the globules that must be shaken off the spiral cord every time it is withdrawn from the tube, and the spiral cord wiped with a duster on to the glazed calico.

2. The india-rubber stoppers are marked with a black ring round them, which shows the depth they must be screwed into the cistern; the stoppers, as supplied by the maker, are in their proper places, and there is no occasion at the first filling to move the stopper through which the tube is passed. To fill the tube you need only to remove the lower stopper, No. 4, and in replacing it, must force it into the cistern with a screw-like motion of the stopper one way, and at the same time a screw-like motion of the cistern the opposite way; in thus screwing in the stopper, it may take a somewhat slanting direction, this is rectified by reversing the motion of the stopper and the cistern, and thus screw it into the black mark. This should be practised two or three times on the empty tube and cistern, it is like putting a cork into a bottle, the latter being too small for the cork.

3. To clean the cistern, take it off the upper stopper, No. 2; this must be done with the same careful screw-like motion as in putting it on, so as not to bring the cistern into contact with the end of the tube, as it may damage it; the rule for placing on the cistern is to bring the end of the tube half-way into the cistern, which is the best place for it, on account of the motion when reversing the Barometer after filling it.

4. Begin by cleaning the cistern outside and in with a clean dry duster

and then the outside of the tube with the same; pass the end of the spiral-cord, with the calico attached, down the bore of the tube, and sweep out all the particles of dust, and whatever impurities may have got in; pass the open end of the tube through the stopper No. 2, which has a hole in it, and let it project about 1¼ inch, so as to reach the middle of the cistern, which now put on with a screw-like motion, and place it on the stand, cistern uppermost. Then thrust the feather end of the spiral-cord down to the bottom of the tube and let it remain there.

5. Now take the filterer, and pour the mercury into the orifice of the tube until it is one third filled. With the fore-finger of the right hand move the spiral-cord round rapidly from left to right, and when it has wormed its way out of the mercury, withdraw the laden feather from the tube; clean the feather-end of the spiral-cord, and put it in again to the bottom of the tube.

6. Repeat the filling up of the mercury one third more, and renew the same action with the spiral-cord; clean the feather once more, re-introduce it, and, having filled up the mercury to within three-quarters of an inch to the top of the cistern, withdraw the feather with the same motion as before, and carefully fill up the space left by the spiral-cord with mercury to within an inch of the top; brush round the cistern with the feather-end of the spiral-cord.

N.B. When giving the spiral-cord circular motion in the tube, as it worms its way upwards and out of the tube, when the spiral-cord is too long to conveniently give it circular motion, on account of its striking against you, tie the end of the cord with a loose single knot, round the tube, under the stopper of the cistern, and it will be out of the way, and help to give the required motion.

7. This done, place the lower stopper, No. 4, with a screw-like motion, firmly and evenly into the mouth of the cistern; place the top of the zinc tube on it, and the lugs of the said top will reach to the stopper No. 2, and then with the right hand reversed make the lugs nip the stopper, No. 2; the cistern and stoppers thus secured, draw the Barometer perpendicular out of the stand; and, still holding it thus firmly, steadily and slowly reverse the Barometer, and replace it in the stand, reeving the upper end of the Barometer through the hole in the upper shelf of the stand No. 2, and land the cistern on the lower shelf, and set it upright, and let it remain with the cover of the zinc tübe, which affords it protection.

8. Lastly, raise the upper stopper, No. 2, sufficiently to admit the ivory disc, No. 5; set it perpendicular, and in the middle of the cistern, allow it to remain a few minutes, read off both scales, the upper one first; their difference is the reading of the Barometer.

Do not use a reading glass of too great convexity, as it will cause parallax; —the convex surfaces are the proper ones to register, and the eye should be placed on the same level as the convex surface and at right angles to the tube, which is easily ascertained by noticing when the reflection of any mark of the graduation coincides with itself.

NOTE.

REMARKS.—1. In emptying the tube, I have noticed that the mercury always takes up a spiral-form, somewhat like a cork-screw, with the handle held downwards; the

same law has been followed in filling with a spiral-cord, and turning it round the same way.

2. In comparing one of my Barometers with one of Newton's of the same size Newton's always fell with a *concave* surface, while my Barometer always maintained *convex*, whether rising or falling, thus making the daily differences more exact.

3. The largest sized barometers can be filled by this process, by only enlarging the spiral-cord and adding more feathers.

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

November 19th, 1873.

Ordinary Meeting.

Robert James Mann, M.D., F.R.A.S., President, in the chair.

Wintour Frederick Gwinnell, 13 Markham Square, Chelsea, S.W.;
Thomas Paulin, Winchmore Hill, Middlesex; and
Theodore Henry Maine Walrond, Army Medical Department, 6 Whitehall Yard, S.W.,
were balloted for and duly elected Fellows of the Society.

The names of six Candidates for Admission into the Society were read.

Mr. E. E. Glyde was admitted a Fellow of the Society.

Mr. W. R. Birt and Mr. J. S. Harding were appointed Auditors of the Treasurer's account.

The following papers were then read :—

"On the Thunderstorm at Brighton on October 8th, 1873, and its effects." By F. E. Sawyer, F.M.S. (p. 5.)

Mr. Scott remarked that it was a very interesting thing to know that Mr. Sawyer could prove that the Lightning was in a Globular form, as it very rarely appears in that form.

Captain Toynbee. In examining the logs of the Meteorological Office, I find that Globular Lightning is frequently mentioned; this will be shown by the published remarks in the work on which we are now engaged.

Mr. Prince. The Globular Lightning is not so unusual as many people suppose. Within the last three years I have seen it four times.

Mr. Symons could quite corroborate Mr. Prince's remark. In 1857 to 1859 he gave a great deal of time to collecting observations of Atmospheric Electricity, and in several instances reference was made to Balls of Fire, some reporters making them two feet in diameter and some merely a few inches. In one instance he remembered a house within a few yards of his own residence which was struck by Lightning; two persons were looking at it at the time it was struck, and they both said that as the ball came down, just before it struck the house, it seemed to divide, one part of it going down the front of the house, and the other, he supposed, going down the back. On examination of the house, it was perfectly clear that there were two distinct lines of discharge; whether there were two balls, or whether the one ball divided into two, is more than he could pretend to say. There is one very interesting point which Mr. Sawyer noticed, and that is the year of maximum number of storms, 1872, and the minimum in 1860. Now these two years have one thing in common. They are the two wettest years we have had for some time; yet we must remember that the summer of 1860 was one of the coldest, therefore we get at the fact that it requires both heat and moisture to account for excessive frequency of storms.

Mr. Prince. In reports made on the subject it has been described as a ball of fire *falling*, therefore it cannot be instantaneous.

Mr. Scott. I have heard it spoken of in Jamaica as coming into rooms, and as being seen to move about.

Mr. Symons. There was one instance of its slowness of motion, in Bedford-

shire: a house was struck, and the person inside was able to get out of doors and see the ball come out after her.

MR. LAUGHTON. I happened to see an instance of this (ball lightning) in Southsea, in the summer of 1870. It was about half-past eight, on the evening of the 16th June. As it passed, or seemed to pass, in front of my house, I, and those who were in the room, heard most distinctly a hissing noise like that of a rocket: it was almost immediately followed by a loud report, not at all like thunder, but rather as of houses falling in. The gloom was so intense that we could see nothing of what had really occurred; but, from the noise, we all fancied the fire ball must have struck and knocked down some half-built houses in the neighbourhood; it was not till the next morning, when we saw them still standing, that we recognised our mistake.

MR. SAWYER. I should like to ask the question, whether the lightning appears to select any special trees for striking.

MR. SYMONS. A list of trees most frequently struck was drawn up some years ago by Professor Arago, and the same has been proved by subsequent experience. The oak is very rarely struck, and there was one tree so seldom, if ever, struck, that tradition has it, that it is proof against it, and that kings had trees of this kind planted in times past so that they could have the protection afforded by them.

THE PRESIDENT. That tree was a kind of cypress, I believe. The elm and the oak are unquestionably often struck.

MR. DINES. The elm because of moisture, and the oak because of the iron, I suppose. The beech I have never heard of as being struck.

MR. PRINCE. Within two-and-a-half miles of where I live, there was a very large beech tree struck by lightning, and cut asunder about six feet from the ground.

Mr. DEANE. There are many poplar trees on Clapham Common, only one of which has been struck, and that twice, by lightning.

"Some of the Considerations suggested by the Depressions which passed over the British Islands during September 1873." By F. GASTER, F.M.S. (p. 8).

CAPTAIN TOYNBEE. As I have been referred to in this paper, I wish to say that my impression is, that Cyclones, and cyclonic movements of the air, are eddies carried along by the prevailing wind which surrounds them, just as an eddy in a river is carried along by the tide.

THE PRESIDENT. It is, I should think, like the eddy between two currents going in the same direction with unequal velocities.

CAPTAIN TOYNBEE. I think it mechanical, the course of the east winds carrying with it all that it finds. The question of whether it is the same air, I must leave.

MR. SCOTT. The idea thrown out in the paper as to the motion of Cyclones being ruled by the position of the areas of high pressure, seems to me to be one of the most fruitful of recent ideas as to weather knowledge. It was first brought to my notice by some remarks from Captain Toynbee; and in the July number of the Quarterly Journal (p. 184) there is a reference to a statement contained in the "Barometer Manual," to the effect that at the Azores the direction of the usual trajectory of cyclones is from N.W. towards S.E. Now, the Atlantic area of high pressure (the Horse Latitudes) lies in a W. direction from the Azores, and you will all remember that the ordinary track of West India hurricanes sweeps round the western border of that same area. It would be extremely interesting if we could get evidence of the usual tracks of storms, wherever they exist, on all sides of this area. In a lecture I delivered last winter, at the London Institution, this view of the mutual relation between storms and anti-cyclones was urged, and it seems to me probable that the cyclones skirt round the anti-cyclones, being carried by the prevailing wind current. If the anti-cyclone lies over Ireland, the wind on the east coast of England will be northerly; and as a fact, when the conditions of pressure are such as I have described, we do find that areas of depression sweep down from the northward over the North sea, causing northerly gales on our east coast. When the area of high pressure lies to the eastward, the path of the cyclones on our west coast is usually from S. to N., and when barometrical readings are highest over France, the track of

cyclonic areas is from W. to E. over these islands. There is one weak point in the theory, viz. that although readings are not unfrequently highest in Scotland, yet an advance of cyclones from the eastward is excessively rare.

Discussion on the "Best Form of Thermometer Stand."

THE PRESIDENT. The next business is to proceed with the adjourned discussion "on the best form of Thermometer Stand." This subject arose out of a paper by Mr. Plummer, read before this Society at the June meeting (Vol. I. p. 241); but the subject was so large that it was adjourned till another meeting, and in the mean time our Secretary has prepared a brief memorandum of the conditions which it seems most desirable to have secured by Thermometer Stands, so as to narrow the discussion, and bring it to bear upon essential points. This memorandum has been printed, and is now being circulated in the room.

NOTES ON THERMOMETER STANDS.

Conditions to be fulfilled.

1. DIRECT RAYS OF SUN.—The contained Thermometers must at all times be shielded from the direct rays of the Sun.

2. TEMPERATURE OF STAND ITSELF.—The stand must be so arranged that even if its own external temperature be raised, the Thermometers shall not be thereby affected.

3. REFLECTION FROM THE GROUND AND FROM SURROUNDING OBJECTS.—As reflected heat must diminish the accuracy with which Thermometers indicate air or shade temperature, these disturbing causes should be excluded.

4. SKY RADIATION.—The temperature of the air alone being desired, it is necessary that the readings of the Thermometers be not lowered by radiation to the sky.

5. INDEPENDENCE OF SURROUNDING OBJECTS.—It being necessary that one pattern of stand be used in all localities, it follows that it should be absolutely independent of all surrounding objects.

6. CIRCULATION OF AIR.—There must be free circulation of air round the Thermometers.

7. RAIN.—No rain should ever reach the dry-bulb Thermometers; for if it does, it improperly lowers their temperature, making them read even lower than the wet bulb.

8. SNOW.—The Stand must also be unaffected by snow, both as abovementioned and from obstructed circulation of air. [Mr. Stow thinks it very difficult to exclude *dry* snow; and that its admission is not very important.]

9. NO ATTENTION REQUIRED.—It is very desirable that the stand should require no attention between the hours of observation.

10. DUPLICATE INSTRUMENTS.—It is desirable, but not absolutely necessary, that room be provided for a duplicate set of instruments.

11. COST.—The Stand should not be costly.

12. TRANSMISSION.—It should be capable of easy transmission by rail or otherwise.

Before entering upon the general discussion, I propose to read these conditions and hear any remarks that you may have to make upon them seriatim. The conditions are:—

"1. The contained Thermometers must at all times be shielded from the direct rays of the sun."

I presume there cannot be much doubt about that. If any gentleman has a doubt, perhaps he will be good enough to express it.

MR. PRINCE. I should like to say a word or two on Thermometer Stands in general.

THE PRESIDENT.—That will come best after we have gone through these Conditions.

No. 1 was then agreed to.

THE PRESIDENT. "2. The Stand must be so arranged that even if its own external temperature be raised, the Thermometers shall not be thereby affected."

This is perhaps a Condition that may require a little discussion. I know from experience that Stands do communicate heat to Thermometers, and have no doubt that some such condition should be secured.

COLONEL STRANGE. I hardly like the words; they seem to imply a doubt whether the temperature of the Stand is liable to change.

CAPTAIN TOYNBEE. Perhaps it would be well to substitute the word "when" for "if."

MR. SYMONS thought it only right to say that these Conditions were drawn up by Mr. Gaster, Mr. Griffith, Mr. Stow, and himself, and it was their intention to express that the Thermometers should not be affected when the temperature of the Stand was raised.

COLONEL STRANGE. If the Thermometers were enclosed in wood, this would apply.

THE PRESIDENT. Do you mean to imply that the temperature will of necessity be affected?

COLONEL STRANGE. If the temperature of the Stand is itself altered.

MR. GASTER. The slip of using "if" for "when" was fallen into by mistake: but we are of opinion that if the temperature of the interior of the Stand were unduly raised, the Thermometers must be thereby undesirably affected. I think, if the meeting so understands it, that is all that is required.

THE PRESIDENT. Suppose we make it read, "The Stand must be so arranged that even its own temperature shall not affect the enclosed Thermometers."

COLONEL STRANGE. I do not understand what is meant by "external temperature," because if the external temperature be affected, then the Thermometer must be affected also.

THE PRESIDENT. My experience is, that Stands generally absorb and communicate heat, and so increase the temperature readings of the Thermometers.

MR. SYMONS might mention that in the case of the "James" Stand, the temperature of the woodwork does not affect the Thermometer.

COLONEL STRANGE. I think the word "external" must be retained; and yet, as the Condition reads, a doubt is implied.

MR. GASTER. I think the meeting generally understands what is meant, and that is all that is needed.

THE PRESIDENT. The condition will stand then:—

"2. The Stand must be so arranged, that even when its own external temperature is raised, the Thermometers shall not be thereby materially affected."

Agreed to.

THE PRESIDENT. "3. As reflected heat must diminish the accuracy with which Thermometers indicate air or shade temperature, these disturbing causes should be excluded." I suppose there cannot be much doubt about that?

MR. SAWYER. It seems to raise the question, should the Stand be closed at the bottom, and does the ground reflect cold upwards?

MR. SCOTT. Reflected cold cannot be spoken of; cold is but a deficiency of heat.

Condition 3 was then agreed to.

THE PRESIDENT. "4. The temperature of the air alone being desired, it is necessary that the readings of the Thermometers be not lowered by radiation to the sky."

MR. SCOTT. This Condition disallows Sir H. James's Stand, M. C. Ste. Claire Deville's Stand, Glaisher's Stand, and in fact every open Stand, and adopts the Kew Stand, or Stands similar to it. I think this is a point that should be well considered. There can scarcely be a doubt that the Condition is desirable, in one sense, but is it practicable?

MR. SYMONS had no wish to lead the meeting to any conclusion, but as the Condition knocks on the head a considerable number of Stands, he thought it only right to say that he held in his hands papers from gentlemen who have given it their attention, and the four gentlemen whose names he mentioned also think this clause should be retained; but he did not wish their opinion to bias that of the meeting in the least.

MR. WILSON. I don't see any reference to radiation from the ground.

MR. SCOTT. See No. 3, implying deficiency of reflected heat.

MR. STRACHAN. I think, under No. 3, we might take the question of radiation from the ground.

COLONEL STRANGE. I think radiation from the ground is not dealt with by Condition 3, and therefore No. 4 would be the proper place for it.

THE PRESIDENT. This would be secured by simply leaving out the wo " to the sky" in No. 4.

Mr. SCOTT. I am glad to hear the opinion expressed about these Stands, a it is rather an amusing comment on the paper out of which the present discuss has arisen. Mr. Plummer wrote in favour of Glaisher's or open Stands, but t decision of this Society is that you should not have open Stands. It is undenia that you will frequently find gentlemen who indignantly refuse to have anythi to do with Thermometers that are not exposed to radiation. I myself think it right opinion to adopt—that Thermometers should not be exposed to radiati

COLONEL STRANGE. Are we to come to a formal and authoritative decisi or we are only arranging terms for discussion?

THE PRESIDENT. The latter only, I conceive. I don't know whether it wo not be sufficient to say, " The temperature of the air alone being desired, it necessary that the readings of the Thermometers be not lowered by radiation.

Mr. LECKY. Or " in taking the temperature of the air alone," (and leave the words, " being desired,") it is necessary, &c.

THE PRESIDENT. Does that make any material change?

Mr. LECKY. The temperature of the air is what is required for the purpo of Meteorology.

CAPTAIN TOYNBEE. Would it not be well to omit the words, " to the sk and " lowered," substituting " not affected" in their stead.

THE PRESIDENT. I think that would do.

COLONEL STRANGE. Shall we say, " The Stand must be so arranged as give the temperature of the air unaffected by radiation"?

Mr. STRACHAN. I apprehend that radiation makes a considerable differen in the temperature of the air about a screen. For instance, a naked Thermomet four feet above the ground would read lower during the night than one surround by a screen; and conversely during the day, because the naked instrument is in fluenced by radiation.

Mr. GASTER. I differ very much from Mr. Strachan. The temperature of the air is very little affected by *radiation*, but is affected by contact; and in order that the true temperature of the *air* may be ascertained, it is necessary that the Thermometer be not exposed to any excess of radiation.

THE PRESIDENT. We will now make Condition 4 read, " The temperature of the air alone being required, it is desirable that the readings of the Thermometers be protected from the communication of other exterior influences."

Agreed to.

THE PRESIDENT. " 5. It being necessary that one pattern of Stand be used in all localities, it follows, that it should be absolutely independent of all surrounding objects."

Mr. SYMONS. In fixing this Condition it was considered that some observers might be cramped for space, and that it was necessary to get one pattern for all localities.

COLONEL STRANGE. Uniformity, then, is the point for consideration?

Mr. SCOTT. M. Plantamour at Vienna, as chairman of the sub-committee on Thermometric exposure, absolutely declined to give a definite answer to this question; and it is perfectly certain that a Stand which will suit a climate like England, will not suit an Indian climate. This question comes opportunely, because we in the Meteorological Office are now asked to devise a form of Stand for China. If I should say, send a " Stevenson" Stand, we should find that that would not suit without alteration.

COLONEL STRANGE. I think that two subjects are mixed up together in this Condition: one question is, whether one pattern of Stand is suitable for all climates; and the next, whether one pattern is suitable to all localities.

Mr. GASTER. When the Condition was drawn, did you contemplate a Stand that could be used in India?

Mr. SYMONS did not, he only meant the difference between one man's back garden, and another man's back garden.

Mr. WILSON. Will Mr. Scott explain why a " Stevenson" Stand would not do for hot climates?

Mr. SCOTT. It is too small, and the height from the ground too slight. There is also another question which arises out of this subject, and that is that in the north, observers will positively refuse to have anything to do with Stands

that are not attached to the windows of houses. The Italians use the "Finestra Meteorologica" on the north side of a house; and on the other hand, in India, you will find that if the Thermometers are attached to the houses, you will not get the true temperature at all. I do not know whether any of you are aware of the origin of the Kew Stand; I have heard that it was simply, that Gen. Lefroy copied a meat safe, when he wanted a Stand for use at Toronto, and used it for a Thermometer Stand, and hence we have the origin of the "Kew" Stand.

COLONEL STRANGE. I think the intention is that we should express ourselves in the clearest possible language; and I would suggest this Condition being divided, one, as to universality of pattern, and second, as to the independence of the Stand from surrounding objects.

THE PRESIDENT. It is proposed then to stand, "that one pattern of Stand should be used in all localities."

MR. SYMONS. There is nothing binding then in the Condition as to height from the ground, it is merely that you should not use any other pattern; therefore he should be inclined to let the words "in all localities" remain.

THE PRESIDENT. Then we will let the clause stand, "It is desirable that one pattern of Stand be used in all localities."

Agreed to.

THE PRESIDENT. "It is desirable that the Stand should be absolutely independent of all surrounding objects."

MR. WILSON. Do I understand that Wall Stands and Window Stands are to be condemned?

THE PRESIDENT. Undoubtedly, if that form of the Condition be adopted.

MR. STRACHAN. The Condition does not say anything about what distance they are to be from the wall.

THE PRESIDENT. It means, "well separated," having no fixed material connection.

MR. SYMONS. It means, "absolutely separated." Say you have a "James'" Stand, eight or ten feet from a wall, you get considerable radiation, and that was the ground of guarding against the influence of surrounding objects.

Agreed to.

THE PRESIDENT. "6. There must be free circulation of air round the Thermometers."

MR. STRACHAN. This would mean there are to be currents of air?

THE PRESIDENT. Not necessarily; it means rather, free access.

COLONEL STRANGE. I think "free access" better than "free circulation."

THE PRESIDENT. "6. There must be free access of air round the Thermometers."

Agreed to.

THE PRESIDENT. "7. No rain should ever reach the dry-bulb Thermometers; for if it does, it improperly lowers their temperature, making them read even lower than the wet bulb." I think there need not be much discussion on this clause.

MR. DINES. Is it possible to keep moisture from the dry bulb?

MR. SYMONS. Very nearly.

MR. DINES. Is it possible with the "Kew Stand"?

MR. SYMONS. We never experienced any difficulty. "Martin's" never received rain but once; and "Morris" only failed twice; "Griffith" never failed at all, and on one occasion, he did not know how, rain was reported in the "Kew" Stand; some of the other Stands of which diagrams were exhibited, have failed thirty and forty times in one year.

No. 7. Agreed to.

THE PRESIDENT. "8. The Stand must also be unaffected by snow, both as above mentioned and from obstructed circulation of air. (Mr. Stow thinks it very difficult to exclude *dry* snow; and that its admission is not very important)." I would suggest that this clause be made to read:—"The Stand must also be unaffected by snow, whether as a direct fall, or by impeding access of air."

Agreed to.

THE PRESIDENT. "9. It is very desirable that the Stand require no attention between the hours of observation." That, I think, must be paramount.

Agreed to.

THE PRESIDENT. "10. It is desirable, but not absolutely necessary, that room be provided for a duplicate set of instruments."

Mr. GASTER. I do not see why a duplicate set is required for the Stand. If you want to test other people's instruments, I do see the reason for it; but I can have duplicates, and keep them in my own house.

THE PRESIDENT. As a matter of practical experience, I have always considered it desirable to have duplicates in the Stand myself.

Agreed to.

THE PRESIDENT. "11. The Stand should not be costly."

COLONEL STRANGE. I think excellence is the point, and not cost; and I would strike out this clause.

Mr. SYMONS. There were two reasons for inserting it: one was because the "Kew" Stand costs about £15; and the other was, that if you recommend such Stands as that, it will be a long time before you get Observers generally to adopt them.

COLONEL STRANGE. We are now endeavouring to set before the scientific public a correct view on the subject, and efficiency should not be sacrificed to economy.

CAPTAIN TOYNBEE. But you surely will allow "it is desirable" that the Stand shall not be costly?

COLONEL STRANGE. I say, it amounts to this, that if a good Stand costs, say 100 guineas, and an inferior Stand, costs, say 20 guineas, you are bound to use the good Stand.

MR. STRACHAN. The cost of the Stand will vary with localities.

Mr. WHIPPLE. The question of the cost of the Stand is trivial, I think, when compared with the value of observations spread over many years; and it is false economy to begin a series of observations with inferior appliances, which in the long-run may cause a break, or even render the observations worthless.

THE PRESIDENT. The meaning of the clause is this. Supposing there are two good Stands, and one is less costly than the other, it is desirable that you should adopt the less costly one.

Mr. SYMONS, in answer to the remarks which have been made, would say, that if Dr. Clouston, a clergyman in the Orkneys, whose observations have proved so valuable, had been put to the expense of ten or fifteen pounds (and it is not at all derogatory to say so) to make his observations, they would have been lost to the public. His opinion was, that the clause should be retained. It might be modified, if desired, by the insertion of some such words as, "providing they are equally good."

COLONEL STRANGE. If two Stands are equally good, and one is more expensive than the other, the cheaper one is obviously preferable; but if you talk of cost, you lead people's thoughts rather towards economy than efficiency, and I think, in scientific questions, cost should have nothing to do with the matter.

Mr. SYMONS, as the meeting was generally agreed on the meaning of the clause, would have no objection to withdrawing it if desired.

Mr. WILSON. I should object to the withdrawal of the clause; the one thing we want is uniformity, but if you decide on a Stand which is expensive, you will exclude a great number of observers.

THE PRESIDENT. I will put it to the meeting, whether this clause shall be retained or not, in the sense that it means as cheap as is consistent with efficiency.

Upon a show of hands being taken, the President declared:—

The clause stands by 10 to 6.

THE PRESIDENT. "12. It should be capable of easy transmission by rail or otherwise."

COLONEL STRANGE. Anything is easy of transmission.

Mr. SYMONS. Try and send "Martin's" Stand.

THE PRESIDENT. It is desirable to retain this clause.

Mr. SCOTT. I think I would give expression to the point.

THE PRESIDENT. Perhaps the better course would be to incorporate the two last clauses into one.

COLONEL STRANGE. Say, "it should be portable."

Mr. STRACHAN. You have not taken into consideration the form of screen for use on board ships.

THE PRESIDENT. That is a point that may fairly be reserved for the general discussion; and as the memorandum of desired Conditions has now been definitely settled, I shall be glad to hear any general remarks on the best form of Stands.

MR. PRINCE then read the following paper:—

Can we dispense with readings of Shade Temperature, as hitherto registered for comparative Observations?

A question has often occurred to me, why, for so many years, we have ascribed such great importance to observations of shade temperature. If the method originated with the notion that we could thereby secure some approach to uniformity, the result has by no means justified the idea. I consider that the practice of recording shade temperature, rendered exceedingly complicated by the infinite variety of thermometer stands, hitherto employed, has been the grand obstacle to obtaining such an amount of uniformity as would render the observations of any six meteorologists in the kingdom fairly comparable. I think, too, that we should take into consideration the relatively small amount of the earth's surface which remains throughout the greater part of the day in shadow, as compared with the much larger proportions, both of land and sea, which are fully exposed to, and more generally under the influence of the solar rays. During the last few weeks I have been making an experimental inquiry as to the relative value of the readings of several fully exposed thermometers, placed side by side on a wooden rail, at an elevation of four feet from the ground. Some three months since, Mr. Symons lent me a set of solar radiation thermometers, which were placed on this horizontal rail or stand, and, in addition, I placed thereupon a self-registering unprotected bright glass bulb thermometer, and an ordinary self-registering spirit minimum thermometer. The readings of these two last mentioned instruments, taken during the months of September and October, deserve, I think, some attention. These observations, however, are probably too limited for the purpose of deducing absolutely definite conclusions, but I am desirous of bringing into notice certain results of temperature which may be obtained from both maximum and minimum thermometers, unprotected by any stand whatever. The difference between the mean daily readings of two bright glass bulb maximum thermometers as similar as possible in their size and *construction*, the one placed in shadow on a modification of Stevenson's stand, and the other fully exposed to the sun's rays, is really very trifling. Thus, during the month of September, the difference was 3°·9·, while during October it was only 1°·9. It should be borne in mind, that during September the greatest difference is found to exist between shade and solar radiation temperature at four feet from the soil.*

In the course of a few weeks, I purpose causing a bright glass bulb maximum thermometer, divested of every incumbrance, *i.e.* unprotected either by jacket or stand, to supersede both the maximum shade and solar radiation thermometers at my observatory; and I think that an instrument of this kind, when exposed to every possible atmospheric variation, will indicate the *true maximum temperature of the air* far more faithfully than a similar instrument, howsoever protected. I was not so fully aware, until quite recently, that the exposed mercurial thermometer possessed the valuable property of reflecting so much of the heating power of the sun's rays, and thereby giving an intermediate reading between shade and solar radiation temperatures, as well as simplifying the question of uniformity in the exposure of instruments.

With respect to spirit minimum thermometers, the exposed instruments, at four feet from the soil, appears to give an intermediate reading between one protected by a stand, and one on grass. If this relative difference is found to be maintained throughout the year, the result cannot be otherwise than important, as showing most distinctly that true night temperature is not to be obtained from the indications of a protected thermometer. It may be considered that in the case of fog or rain the bulb would be too much cooled down, by a subsequent evaporation, to render a correct reading, but I wish to maintain that such a result would be due to important natural conditions, viz. *circumstances and locality*, neither of which ought we to disturb or misrepresent. Every leaf and blade of grass is subject to this self-same influence, which regulates, to a certain extent, the actual temperature of the air, for some distance, from the surface both of vegetation and the soil. As evidence of the importance of the indications of the exposed minimum thermometers, at four feet from the ground, I will cite an instance which occurred on the last morning of October: upon going out of doors I found the ground was frozen so hard that a wheelbarrow, in passing over it, did not leave

* I obtain this information from my own observations at Uckfield, during a period of fifteen years, ending with 1860.

any impression. Hoar frost was upon all the evergreen trees and shrubs. The readings of my three minimum thermometers were as follows: the exposed at four feet, 27°; terrestrial radiation, 21°; but that protected by stand was not lower than 32°. Had the latter instrument been the only one employed, would it have represented the true minimum temperature of the air on that morning? The mean of the daily readings of these three thermometers was as follows:—

	September.	October.
Mean of daily readings of protected min. ther.......	47°·0	42°·7
„ „ „ exposed „ „	44°·5	39°·7
„ „ „ radiation „ „	42°·5	37°·3

The above results, as well as those obtained from the exposed maximum thermometer, appear to make it desirable that meteorologists should record the indications of exposed as well as protected thermometers.

With reference to the construction of thermometers, I think the following points should be considered:—1st, that the bulbs of all thermometers should be of one uniform size; 2nd, that they should be made, if possible, by one person; 3rd, that no Fellow of this Society should employ a thermometer which has not been carefully examined by one of its officers, appointed for that purpose; 4th, that all thermometers at present in use should be compared with a recognized standard, and tested as minutely as our rain gauges; 5th, that an agreement should be made as to the standard height above the ground at which both exposed and protected instruments should be placed; 6th, that the Society should not accept observations from any Fellow who does not comply with their regulations.

This latter suggestion leads to the inquiry, who are the Observers for the British Meteorological Society, what returns do they make, and what becomes of their observations? With the 'Proceedings' are issued the returns furnished to the Registrar-General, but I think something more than this should be obtained and circulated by the Society, in the twenty-fourth year of its existence.

Mr. Strachan. Mr. Scott has informed me, that in France they swing the Thermometers by hand, in order to get the temperature of the air. On several occasions, I tried the same experiment, and in each case it did not show more than half a degree different from the temperature in the shade. It appeared to me extraordinary that the Thermometer whirled round at the end of a cord in full sunshine, should give the same temperature as the Thermometer in the shade gave. I have not carried on these experiments with sufficient care to be able to arrive at any conclusion, but merely name them cursorily with a view that probably some observers may take up the subject.

The President. If you were to blow a stream of air upon a Thermometer, you would of necessity get an approximation to the temperature of the air current.

Mr. Strachan. But in my experiment the Thermometer was exposed to the sun's rays for three or four minutes.

Mr. Scott. I cannot exactly agree with Mr. Strachan, that the readings of the Thermometer swung (*Thermomètre fronde*) are the same in the sun's rays as in the shade. I take one round on my inspection, and I find that whenever the sun is shining, to get the temperature to agree with "Stevenson's" I am obliged to go into the shade.

Mr. Symons. This was analogous to one of the experiments referred to in the paper on Radiation, published in 1851, by Mr. Glaisher; and when this present question of Stands came before him, he thought it a capital opportunity to repeat Mr. Glaisher's experiment. The first thing he did was to erect a broad ladder, and a pole twenty feet apart, and to suspend a Thermometer between them, and thirteen feet from the ground. The result was, it agreed fairly with the "Kew Stand," if the sun did not show itself, if it did, up went the Thermometer; if it rained, the suspended Thermometer was too low; and the conclusion he came to was, that agreement only arose from the *plus* errors balancing the *minus* ones. He then thought, perhaps thirteen feet above ground was not high enough; the same difficulty was found on getting up to twenty-five feet, and eventually he was obliged to throw over the whole system.

I have in my hands a letter from Mr. Stow on the subject, which I will read. (p. 49).

I have also received through Mr. Eaton, a long communication from him (Mr. Stow), in which he expresses his opinion, that if the "Stevenson" Stand were

made larger, something between its present size and a "Kew," it would meet nearly all the Conditions laid down in the paper we have been considering. (p. 50.)

Mr. STRACHAN. Might I ask what is the object of this discussion?

THE PRESIDENT. The object is simply the discussion of practical points raised by the reading of a paper by Mr. Plummer, in June last.

Mr. SYMONS. The paper read was "On some Results of Temperature Observations at Durham," but the point of it was a comparison of the "Kew" with "Glaisher's" Stand, and the then President said that "there was one point in the paper which the meeting could not discuss that evening viz. as to the best form of Thermometer Stand, and he would therefore postpone the discussion of that subject to the first meeting next session."

Mr. STRACHAN. What is to be the result?

THE PRESIDENT. I myself have some doubt whether, at this instant, this consideration is ripe for final and authoritative decision.

Mr. SCOTT. I confess I somewhat share the opinion that seems implied in Mr. Strachan's question. We have put down a set of Conditions for Thermometer Stands. Are we to say that one particular form of Stand goes further to fulfil those Conditions than another? if so, I would add that a Stand entirely enclosed with wood louvres is best for the British Isles, and propose that you put the question to the meeting, and see how many present agree with the idea.

Mr. GASTER. I feel much as Mr. Strachan and Mr. Scott do. I do not know how we have drifted into this discussion. Our subject was a paper ot Mr. Plummer's, and here we are now discussing Thermometer Stands; advocating one and condemning another, freely. I thought that, after circulating their different propositions, and reading them out, Mr. Symons would give us a brief summary of the Thermometer Stands tested, stating which he considered best, and his reasons for so doing. If this had been done, I think we might have come to some sort of conclusion as to which form of Stand was best; and with a view to this being done, I will move that the discussion be adjourned for another meeting.

THE PRESIDENT. It would have been quite competent for you to have carried out that suggestion yourself. But my own opinion is that we do get a large measure of good from a discussion of this character, even when we stop short of adopting a final resolution. A delayed, and well considered decision is of more real worth than a hasty one imperfectly matured.

Mr. GASTER. I am, and have been, working for Mr. Symons, but thought he was at liberty to do so.

Mr. SYMONS would be most happy to express his opinion, if the meeting liked to sit all night; he thought the sense of the meeting should be taken whether the discussion be continued or not.

Mr. STRACHAN. I suppose the discussion will appear in our 'Proceedings.' Would it not be desirable to summarise the discussion, and give it a sort of authority?

THE PRESIDENT. We have no other decision at present before the meeting, than such as is implied in the Memorandum of Conditions that have been agreed to.

Mr. STRACHAN. Then we cannot settle the question till we have heard Mr. Symons's full views.

CAPTAIN TOYNBEE. It does seem to me desirable that we should have a Report on this subject from those who have gone most completely into it, and that it is rather premature to ask us to arrive at a definite decision until we have such a Report, or at least a further opportunity to consider the question.

Mr. SYMONS could not state the full results of the experiments until he had sent them to the Royal Society; it would not be honorable on his part to do so, as the Royal Society have paid part of the cost of the experiments. What he would have done, had the meeting wished it, would be to have given his own impressions and referred to his own results as far as he could go in honour to the Royal Society.

CAPTAIN TOYNBEE. Then we are, in reality, too soon with our consideration of the subject, and not too late.

Mr. SCOTT. The Secretary has to draw up a Report to the Council, for their January meeting. Could not that Report contain a summary of the results that bear upon the subject of this discussion? Mr. Symons has paid a great deal of attention to this subject; but he cannot communicate the Straithfield Turgiss experiments to this Society as yet, because the Royal Society has paid for them, and have the first claim upon them.

THE PRESIDENT. I quite agree in the advisability of the course suggested by Mr. Scott.

Mr. STRACHAN. And I think myself that this suggestion would well meet the requirements.

Mr. SYMONS. I shall be most happy to comply with it.

THE PRESIDENT. We hold that these discussions have the advantage of eliciting an expression of opinion from individuals who have given careful consideration to the matter; but upon this occasion we may further congratulate ourselves upon the Report we are thus allowed to anticipate from the kindness of our Secretary.

The meeting was then adjourned.

DECEMBER 17th, 1873.

Ordinary Meeting.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

EDWARD GEORGE ALDRIDGE, 24 Guildford Street, Russell Square, W.C.;
C. W. BOURNE, M.A., Marlborough College, Wilts;
JAMES DEANE, 17 Pavement, Clapham, S.W.;
WILLIAM HENRY DUNLOP, Annanhill, Kilmarnock, Ayrshire;
CHRISTOPHER GEORGE, Staff-Commander R.N., Royal Geographical Society, 1 Savile Row, W.; and
H. S. KNIGHT, 2nd Battalion 19th Regiment, Allahabad,

were balloted for, and duly elected Fellows of the Society.

The following papers were then read:—

"On an Improved form of Aneroid for determining heights, with a means of adjusting the altitude scale for various temperatures." By Rogers Field, B.A., F.M.S. (p. 10).

Mr. BROOKE said that no notice had been taken in the paper of the necessity of uniform graduation, in order that a shifting scale of heights may be applicable, which is an important point. The spaces representing inches should be all alike; for if they be not equal, a scale of heights correct in one position must necessarily be incorrect in all others. He had examined several aneroids with long scales, and had found considerable inequality in the spaces representing successive inches. There would be less difference in this instrument, as the scale is short; but in a scale of 4 inches there may be considerable inequality. Mr. Casella had informed him that he found the relative inequality varied in different instruments, but that he selected those instruments of which the scales were nearly equal for the application of the shifting scale; otherwise it is obvious that errors might be introduced, larger, perhaps, than those designed to be corrected.

Mr. STRACHAN said the author had disarmed criticism by disclaiming any pretence to perfection in his contrivance. As regarded the inequality of the graduation of the inches, it was not so serious as Mr. Brooke seemed to think. Such inequality ought most certainly to be expected; but the fact was, it was almost imperceptible in aneroids of only 4-inch scales, and was only of any consequence in those having scales ranging through 16 inches of pressure. Out of any hundred aneroids taken haphazard, probably 80 would be found to have scales of equal parts. The drawback in connection with this contrivance was that the temperature of the air cannot be known beforehand; and if an assumed temperature be used, the result will very likely be inaccurate.

Mr. PASTORELLI said that the graduations of aneroids were made to agree with the inches on a mercurial barometer, and were not necessarily equal to each other, but usually they were to all intents equal throughout. This instrument is an advantage, as most people will not take the trouble to correct their observations for temperature; they merely set the zero of the altitude scale to 31 inches, and read off the difference in feet, which they assume to be the true height.

Mr. CASELLA said that the instrument was very ingeniously designed, though its advantages were not apparent at first sight, as the variations in the temperature of the air are very great, and cannot well be allowed for in manufacture. Almost all aneroids vary in the length of the different inches on the scale; what

is wanted for this kind of aneroid is uniformity. He had seen verniers applied to aneroids, but he believed that they only deteriorate the value of the instrument. Mr. Field had told him that a difference of 5° or 6° from the setting point would not be of much account in his instrument.

Mr. WHIPPLE thought that Mr. Field's arrangement was a very ingenious one. His own experience of aneroids, however, was that they vary very much at low pressures. He believed that the mechanism of aneroids should be so perfected as to enable them always to give the same readings as the mercurial barometer. He found that at present many instruments, when submitted to the same low pressure at different times, give different readings. He thought it almost an unnecessary refinement to carry out the temperature scale whilst the general mechanism of the instrument requires improvement. Although the inches on the aneroid may be of the same angular values, it does not follow that the readings represent the same variations of pressure. He thought the instrument might be of use to surveyors, but not to meteorologists.

Mr. SYMONS was very sorry Mr. Field was unable to be present, as he would have been better able to have replied to the questions than himself. He thought that he must have read the paper indistinctly, for it expressly stated that the instrument is only intended for the measurement of small differences of altitude, in fact, for the use of engineers and surveyors, so that Mr. Brooke's and Mr. Whipple's remarks were, to a great extent, beside the question. With reference to the liability to error in estimating the temperature, in practice it was found to be very slight; he had made a number of experiments, and he had had only two failures. If the temperature does vary much, you continue to use the outer scale, and afterwards read off from the inner one, and apply corrections from tables in the usual way. The method is also very good for those who are bad calculators, and the general public who know nothing of tables for corrections, &c., for they have only to drop down the scale at about the air temperature, and get correct altitudes at once.

"On the Hurricane of August, 1873, which moved in a curved track round Bermuda, between the 20th and 23rd, and passed on to Nova Scotia and Cape Breton on the 24th, doing extreme damage both at sea and on land." By Capt. H. Toynbee, F.R.A.S. (p. 15).

Captain TOYNBEE said that his friend, Mr. Wilfred Airy, had been with him that morning, and said that after reading Mr. Meldrum's paper, he had been experimenting on the motion of water through an orifice, and found that it moved in curves similar to those of Mr. Meldrum's diagram.

The PRESIDENT asked whether it was or not a fact that, under either point of view, a captain, supposing himself involved in a hurricane, would be right in steering towards the right, or to the starboard.

Captain TOYNBEE replied that the tack on which a ship should go depended upon which half of the cyclone she was in; supposing the cyclone bisected by its own track.

Mr. BUDD thought that if the centre of a cyclone were moving with great velocity, there would be a movement of the air over the earth's surface, in addition to its movement relatively to the centre of the cyclone, and that, therefore, the wind figure, as deduced from observations at fixed points, would differ from the true eddy figure within the moving mass of air.

Captain EVANS observed that the hurricane or revolving storm theory had been established in the minds of seamen for 30 years; we ought, therefore, as this theory had borne good fruit, to be cautious in accepting views tending to shake it.

It is possible to explain the facts presented to the Society without calling in question the general accuracy of what may be termed the "circular" theory. Mr. Meldrum, who is a high authority, speaks guardedly against so disputing it; and the hurricane under review does not clash with his general views. It was a part of my duty at the Admiralty to examine the report of H.M.S. 'Cherub;' it was evident that the vessel, which was, in point of fact, at one time not far from the centre of the storm, had been admirably managed and guided by the "circular" theory. Another ship of war, the 'Sphynx,' was at the same time 150 miles to the eastward of the 'Cherub.' The 'Sphynx' had it blowing hard—a fresh gale; —but no indications of a hurricane are recorded in this ship's log. Indeed, the

barometer stood at 29·95 inches, whilst the 'Cherub's' barometer stood at 28·93 inches, or a full inch lower, accompanied with all the well-known signs of a hurricane.

Now, if we are to attempt to lay down on a chart the exact centre of the 'Cherub's' hurricane, according to the direction of the wind blowing at the same time at each of these ships, we shall find the resulting position some distance away from the real storm centre, as experienced by the 'Cherub:' the reason being that the conditions are not identical; the one ship was in the area of a low barometer, the other ship in the area of a high barometer. In short, the "circular" theory would be overstrained to treat the two cases as identical.

To work out with confidence the path of the vortex of these revolving storms and their several conditions from the logs of a number of ships, we require to know the state of each ship's barometer for several consecutive hours; fairly exact records of the several shifts of wind, both as to time and direction, and those symptoms of sea and atmospheric disturbance which mark the coming, passing, or disappearance of the storm.

Mr. Scott remarked that Mr. Meldrum had said that the fact of the barometer being 0·6 in. below its usual level was a proof of the ship being in a cyclone. He did not believe that the reading of the barometer at the centres of all cyclones was the same; in some it was apparently about 29·0 in., while in others it was an inch lower than that. He held that the violence of the storm did not depend on the actual reading of the barometer at any time and place, but on the difference between the simultaneous readings at two adjacent stations, or on the gradient.

He would take advantage of the present opportunity to make two announcements of interest as regards our own storms. The first was that, at the suggestion of the Signal Office, U.S.A., a system of synchronous observations would be instituted at as many stations as possible, beginning on the 1st of January. The observations would be sent in fortnightly. The hour for the British Isles would be 0·43 p.m. The existence of such a set of observations would render it possible to construct real synoptic charts for weather, which had hitherto been impossible, owing to the differences of time. He invited observers to co-operate in the scheme.

The second was that the Meteorological Committee had allowed him to fulfil his hopes expressed in his paper of March last, and had announced their readiness to return to the use of Admiral FitzRoy's Cones with the Drum Signal, so as to indicate the probable direction of the wind in storms.

Mr. Casella had been much struck with the height of the barometer, viz. 29·78 in.; he thought it would have been better if it had been stated what it had fallen from, and whether such fall had been sudden, or otherwise.

Captain Toynbee said, in answer to Captain Evans, that Mr. Meldrum had published his paper in the Proceedings of the Mauritius Meteorological Society, which was a sufficient proof that he thought the facts should be made known, and it was with his entire approval that it had been republished by the Meteorological Committee. In his letter he said, "The subject is, I think, a very important one." He did not agree with Captain Evans in thinking that ships with comparatively high barometers were not under the influence of a cyclone; on the contrary, he thought that all ships which had their barometers and winds at all influenced by its area of low pressure might be said to be in it.

To Mr. Scott he said that he did not quite remember Mr. Meldrum's words, but thought that his allusion to a fall of five or six tenths of an inch in the barometer was not as a proof of being in part of a cyclone, but as to the bearing of its centre.

To Mr. Casella he said that a ship's log did show the changes which had taken place in her barometer, which was, of course, a useful warning to her commander; but that in working up these gales, the great desideratum was to have simultaneous observations from a large number of ships in various parts of the sea.

In conclusion, he wished it to be understood that the object of the paper was not to state as a fact that the shape of Northern Hemisphere cyclones agreed with the diagram before the meeting, but merely to bring to the Society's notice that, as so practical a man as Mr. Meldrum had worked out, from actual observations, that the shape of, at any rate, two cyclones in the Southern Indian Ocean

differed so materially from the circular theory, that the rules for avoiding them needed to be greatly modified, it behoved Northern Hemisphere Meteorologists to apply a similar method to their cyclones; and that he thought the cyclone of August, 1873, offered a fitting opportunity for such work.

The PRESIDENT, at the close of the discussion, drew attention to the three practical bearings of the matter that had been brought into prominent notice, namely:—1. The expediency of distinguishing between strong winds and true cyclones; 2. The importance of considering the amount and rapidity of fall in the column of a barometer at sea, quite as much as its absolute depression; and 3. The fact that it is always the difference of barometric pressure at two neighbouring spots that it is of most importance to know in dealing with the phenomena of cyclonic movements of the air; a circumstance, however, which a captain's observation on board his own ship, designed mainly for his own particular guidance, is not competent to mark.

"On a Mercurial Barometer for the use of Travellers; filled by the spiral-cord method." By Staff-Commander C. George, R.N. (p. 29).

The Meeting was then adjourned.

CORRESPONDENCE AND NOTES.

THE BEST FORM OF THERMOMETER STAND.

To the Secretary of the Meteorological Society.

SIR,—As the subject of Thermometer Screens may soon be before the Society, I think it may not be amiss to send you the results I obtained last June at Harpenden. Two similarly constructed screens of the pattern which, in the Strathfield Turgiss experiments, is described as "Stow No. 2," were placed near one another, one of them (the same which was tried at Strathfield Turgiss as a single screen) having had an outer row of louvres fixed on the back. The construction of the screen with a double overhanging roof appeared to render any alteration unnecessary for the *sides*, as the sun could seldom shine on them. The dry and wet bulb thermometers in the double screen had elongated, those in the single screen round, bulbs. Phillips' maximum and Casella's mercurial minimum thermometers were employed. One of the latter was very good, but I suspected the other of slight irregularities of action. I do not attach much value, therefore, to the results for the minimum, but of the exact accuracy of the rest I am satisfied. The maximum exposed to radiation or reflection from the ground was a Negretti. I have added the amount of solar radiation (difference between solar black bulb and shade max.) in order that the effect of the sun on the readings may be traced, though no doubt duration of sunshine ought also to be taken into account. It would appear that, although the differences are not great, they are sufficient to make it desirable that a double row of louvres should be used, so as to prevent the sun from heating the wood, to radiation from which the thermometers are exposed.

From the column G—D. it will be seen that it is still more desirable that thermometers should in all cases be protected from heat proceeding from the ground, which must always render the maximum *in summer* unduly high. I continued the experiments with this exposed thermometer for several months, at intervals. It will be seen that G—D. diminishes after July, and in October well nigh vanishes, at least in the north of Yorkshire. This is, of course, what might be expected.

If the question of height above ground is also brought in, I shall be happy to submit to the Society the daily readings of maximum and minimum thermometers in louvre board screens 4-ft. and 18-ft. above ground (the latter being fixed to a pole on the top of Harpenden Common), if it is thought that such readings would be of any advantage.

I am, Sir, yours truly,
FENWICK W. STOW.

Aysgarth, Bedale, Nov. 1st.

Differences of Temperature in single (S.) and double (D.) louvre-board screens; and of a Maximum Thermometer in double louvre-board screen exposed to radiation from ground (G.), and another protected from it in same screen (D.). June 1873. Harpenden.

June.	9 a.m. Dry.	9 a.m. Wet.	9 p.m. Dry.	9 p.m. Wet.	Registered. Max.	Registered. Min.	June. Max.	July. Max.	Aug. Max.	Sept. Max.	Oct. Max.	Amount of Solar Radiation, June.
	S.—D.	S.—D.	S.—D.	S.—D.	S.—D.	S.—D.	G.—D.	G.—D.	G.—D.	G.—D.	G.—D.	
1	+0·1	+0·2	+0·1	+0·1	+0·3	0·0	—	+2·1	—	+0·7	—	49·7
2	0·2	0·0	—0·3	—0·3	+0·6	—0·3	+1·2	1·9	—	0·7	—0·1	50·1
3	0·2	0·1	—0·3	0·0	+0·4	0·0	1·2	1·4	—	1·1	+0·1	58·8
4	0·7	0·6	—0·4	0·0	+1·0	+0·2	1·1	1·8	—	1·1	—	53·8
5	0·0	0·1	+0·1	0·0(?)	+0·4	0·0(?)	—	0·3	—	1·0	+0·1	44·8
6	0·1	0·0	+0·1	0·0	+0·2	+0·2	—	1·3	—	1·6	—	13·8
7	0·4	0·3	—0·9	—0·4	+0·8	—0·6	1·4	1·2	—	0·2	—	59·8
8	0·4	0·5	—0·1	0·0	+0·9	—0·4	1·4	1·6	—	1·0	—	66·4
9	0·3	0·4	—0·1	0·0	+0·6	—0·3	1·0	2·0	—	0·7	—	61·0
10	0·1	0·0	[0·0]	[0·0]	+0·2	+0·2	1·1	1·3	—	0·4	0·0	32·8
11	0·8	0·7	—0·1	—0·3	+0·4	+0·1	1·4	1·0	—		0·0	67·1
12	0·2	0·7	—0·4	0·0	+0·5	0·0	—	1·4	—	Mean.	—	54·9
13	0·2	0·7	—0·1	+0·1	+0·4	+0·1	1·7	1·4	—	+0°·85	+0·5	65·7
14	0·4	0·3	0·0	+0·5	—0·1	0·0	1·3	1·2	—	—	—0·2	60·8
15	0·8	0·4	0·0	+0·1	+0·8	+0·4	—	1·0	—	At Aysgarth, in Wensleydale, Yorkshire.	+0·6	55·6
16	1·2	0·7	—0·1	+0·1	+1·1	+0·3	2·3	—	—		—	66·5
17	0·6	0·6	—0·3	—0·3	+0·7	0·0	1·5	—	—		—	55·0
18	0·0	0·1	+0·1	0·0	+0·6	—0·3	1·2	—	—		—	68·9
19	0·8	0·1	—0·6	—0·5	—	—0·2	—	—	—		—	[60·0]
20	0·1	0·5	—0·4	0·0	+0·4	—0·2	1·0	2·0	—		—	54·8
21	0·1	0·0	—0·9	—0·3	+0·4	+0·8	1·2	1·1	—		—	62·0
22	0·0	0·0	—0·1	+0·3	+0·5	—0·3	1·6	1·4	—		—	59·1
23	1·0	1·2	—0·4	—0·2	+0·5	+0·6	1·9	2·0	—	—	—	64·2
24	0·4	0·7	+0·1	+0·1	+0·1	—0·5	0·0	1·4	—	—	—	45·4
25	0·1	0·0	—0·1	+0·1	+0·0	+0·4	0·9	1·3	+1·3	+1·0	—	41·9
26	0·3	0·3	0·0	+0·2	+0·6	—0·1	1·3	1·8	1·4	—0·5	—	57·3
27	0·6	0·7	+0·1	+0·2	+0·2	+0·5	1·7	1·7	0·9	+0·8	—	58·8
28	0·1	0·4	—0·4	+0·3	0·0	+1·0	1·4	—	0·8	+0·3	—	65·4
29	0·7	0·5	—0·2	+0·1	+1·1	+0·2	1·7	—	0·7	+0·4	—	61·5
30	0·3	0·7	+0·1	+0·1	—0·1	+0·6	0·0	—	1·2	—	—	9·8
								—	0·2		—	

My dear Sir,—As I cannot be present at the discussion on Thermometer Stands, and as I have taken a good deal of interest in the question, I will just put down in a few words the conclusions at which I have arrived, leaving you to make what use of them you think best.

The four modes of exposure among which we have to choose are these:—

1. A louvre-board screen in *the open.*
2. An open stand also in *the open.*
3. A louvre-board screen attached to the north side of a building.
4. An open stand fixed on the north side of a building.

All other modes of exposure are practically out of court.

Of 1, the Kew Stand, as tried at Strathfield Turgiss, is the representative.

Of 2, the Glaisher Stand, as used at Greenwich Observatory.

Of 3, the Thermographic and other instruments used at Kew, and other Observatories belonging to the Meteorological Committee of the Royal Society.

Of 4, the exposure adopted at the Cambridge Observatory and others, no doubt, with which I am not acquainted.

The chief objections to the Glaisher and all other open stands are these:—

1. The thermometers are very often wetted, and the dry bulb thereby made a wet bulb.

2. They are exposed to radiation of all kinds. By night the bulbs are cooled below the temperature of the air on clear nights, and by day this loss by radiation is usually more than counteracted by the heat reflected from clouds, and that reflected or radiated from the ground during the greater part of the year. It is only when the sky is quite overcast, or when these sources of error chance to counterbalance one another, that the temperature of the air can be correctly shown. I do not see how this can be denied, or the error shown to be insignificant. *Mean* values may, no doubt, by means of suitable corrections, be deduced from such observations; but *both extremes must be wrong*. Some experiments of my own, lately published by the Society, in a paper called 'Thermometers in Sun and Shade,' bear on the subject, and a few more figures since obtained, which show the amount of heat received from the ground, have been communicated to the Secretary, Mr. Symons. I have no doubt that the Strathfield Turgiss experiments will be found sufficiently to prove the faultiness of such exposure.

3. The amount of error is different in different parts of the same stand, so that you cannot place two maximum or two minimum thermometers on an open stand and get the same temperature always registered. No doubt the symmetrical arrangement of the thermometers adopted by Mr. Glaisher mitigates this evil, but does not altogether obviate it.

The chief objection to exposing thermometers on the north side of a building is:—

The correctness of the temperature can only be depended upon when there is a complete circulation of air, as the tendency of things in such a position is to be unchanged in temperature. Air warmed by the sun has to be brought from a distance. If there is no wind, or if the exposure is not as free as possible, the temperature may easily be many degrees different from that in the open. Obviously much depends upon the size of the building. A screen fixed on an isolated, low wooden shed, will give a temperature not very different from that in another screen in the open, whereas one attached to a large building will show too little range of temperature, by some 5° at least, in fine summer weather. In the latter case, the air warmed by the sun has to be brought from a greater distance, and is cooled on its way by contact with cold walls and cold ground. No doubt, also, the slowness with which walls change their temperature has a direct influence on the range of temperature shown by thermometers within a few feet of them.

On this account I can only regard such positions as the last resort, where no better can be obtained; and I greatly fear that it will be found that such observations are not available for strict comparative investigations of climate, unless all the buildings are specially erected of one and the same type, as small and low as possible.

Perhaps I ought to say that I have been able to trace the effect on the temperature indicated, both of the varying velocity of the wind and of the varying length of the shadow cast in front of a screen so placed on the north side of a building. Thus, if the temperature was 2° lower than in the open, when the shadow was 10-ft. long, the difference would gradually diminish, and at length vanish, as soon as the sun shone along the building, the previous defect becoming an excess as soon as the evening sun shone against the wall. Such experiments, however, were made in a somewhat desultory manner, and, though they satisfied my own mind, as far as they went, I had not the means of testing the subject thoroughly.

The same objections apply to the fourth mode of exposure, with the addition of certain other objections peculiar to open stands. Such a device as hanging thermometers at a window may, under favourable circumstances, be used, but not, I think, as the sole method of observation.

On the whole, I consider that by far the best mode of exposure is that of a good louvre-board screen in the open. From some figures I placed the other day in the Secretary's hands, it will be seen that I think it decidedly better to have a *double* row of louvres, although the difference does not appear to be great between double and single screens. I believe that a *single* screen of mine, which was tried at Strathfield Turgiss, gave a maximum temperature about 0°·75 higher than the large Kew screen, and afterwards I found a similar screen give a maximum temperature 0°·5 higher than another of the same kind which had a double row of louvres at the back. Thus, the difference between two double screens of very different pattern would seem to be only 0°·25.

I suppose, therefore, that the shape of the screen is immaterial. It should have a double roof, double louvres at back and sides; and if the sun is permitted to shine on the ground beneath it (which the Kew screen does not allow), the bulbs must be protected from the heat from this source by partially closing the bottom of the screen. It is a question whether the louvres should be large or small. If large, they become hotter in the sun; if small, they are cooled by imparting heat to the air which passes inside the screen, and that is, perhaps, worse. I would make the inner row about 2 inches, the outer about 3 inches wide. The wider they are, the cheaper the screen.

As for height above ground, 5 or 6 feet would be better than 4 feet on the whole, and not inconvenient. The difference would be slight, I imagine.

To H. S. Eaton, Esq., M.A. FENWICK W. STOW.

Climate of the Gold Coast: Elmina, Christiansburg.

Translated, with the author's permission, from a Paper by Dr. J. Hann, *in the Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie*, vol. ix. p. 42.

In the following we give the result of several years' observations on the Gold Coast of Africa. The sources for it are "Observationes meteorologicae per annos 1829-34 et 1834-42, in Guinea (Christiansburgi) factæ a Trentepohl, R. Chenon, F. Sannom: Hauniæ 1845;" and "Meteorol: Waarnemingen in Nederland an zijne Bezittingen, 1862: Utrecht, 1863." The last publication contains the observations by Daniels at Fort Elmina, 1860-62, worked up by Krecke. The hours of observation are 6h., 2h., 9h.; after hourly observations, the mean of these three epochs is very near a true mean. The instruments are said to be very good. They were, also, compared, and the corrections have been applied to the results. The extremes and the daily amplitudes are taken from the readings of a maximum and minimum thermometer. The absolute extremes of temperature were 89°·6 F. and 61°·7. The mean extremes of pressure 30·060 in. and 29·741 in. The amount of yearly evaporation was determined to be 54·80 in. The rainfall is remarkably small, not greater than even in the lowlands of Germany.

There might be some doubt as to the accuracy of the measurements, if two series of observations, with different periods and different instruments, had not given the same result. Quantities of 1·57 in.—1·97 in. in a day are the greatest. What an enormous difference there is between the rain at Sierra Leone (125·79 in.) and Fernando Po (100·67 in.), and even Lagos, which is close by!

There are two rainy periods on the Gold Coast; a chief rain period from the beginning of August, and the later rains, which begin towards the end of August, and sometimes last till the middle of October.

The direction of the wind is SW the whole year through; in the morning the land wind blows from NNW up to 11 a.m., then until 9 p.m. the SSW, a sea wind. The force is greatest in the morning and evening. In the yearly periods the maximum wind force falls in the months June to August, the minimum, December to February.

A specialty of the climate is the Harmattan, a very dry, cool, east wind, bringing red dust with it, which blows between November and March. On the mean of observations, at Christiansburg, its frequency is:

November 1.	December 5.	January 10.
February 2.	March 1.	

For the mean direction of the wind on Harmattan days the same observations give the following means:

7h.	9h.	12h.	4h.	9h.
N 22° W	N 12° E	S 64° E	S 34° E	S 8° E

The mean humidity at noon with the Harmattan is 47 per cent. Deviation from the mean at this hour is -27 per cent. Daniels observed on the 5th January, 1860, at 11 a.m., 31 per cent., during the Harmattan. The Harmattan is said to have hardly any effect on the mean temperature, only while it blows the mornings and evenings are cooler, the middle of the days hotter: the daily variation is, therefore, greater. Pressure is higher on the mean, about 0·051 in.

Those revolving storms which are known as tornados, and appear suddenly, almost all come from the quadrant of the sky between NE and SE, never from that between SW and NW. They produce a strong chill in the temperature, about 9° on the mean (even as much as 21°·6), and make the barometer rise.

The temperature and pressure at Christiansburg extend over 4-5 and 7-8 years respectively; the rainfall over 9 years. The observations are often taken on the day between 6 a.m. and 9 p.m., and the daily range of both elements has been obtained from these. By means of them the true means have been determined. The greater monthly amplitude of barometer compared with Christiansburg must be accounted for by the fact of more frequent observations. The mean variation of the year is very small; the non-periodic variations, after we extract the periods, scarcely exceed 0·197 in. in the maximum. The mean yearly extremes are 30·099 in. and 29·701 in., the absolute extremes 30·123 in. and 29·654 in. The maxima of temperature are much higher at Christiansburg than Elmina; perhaps the latter is more freely exposed to sea breezes. On glancing through the observations at Christiansburg, one might believe that the thermometer at noon was not altogether sheltered against radiation.

The semi-monthly means of temperature and pressure at Christiansburg are calculated according to Bessel's Formula. By its help we find the following four points of flexure for the annual curves of pressure and temperature:—

Temperature	2 Min.	1 Max.	1 Min.	2 Max.
	17 Jan., 80°·4	14 April, 83°·8	8 Aug. 76°·1	20 Nov., 81°·5
Pressure	1 Min.	1 Max.	2 Min.	2 Max.
	in.	in.	in.	in.
	21 March, —0·055	27 July, +0·087	4 Dec., —0·032	31 Dec., +0·028

The sun is vertical over the Gold Coast in the first week of April and in the second week of September.

In conclusion, we add the results of a seven months' series of observations by Mr. Charles Turton, at Lagos (Slave Coast), from the "Proceedings of the British Meteorological Society," Vol. II. p. 157.

Lagos, Latitude 6° 12′ N, Longitude 3°25′ E, at sea level.

1863.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.
	in.	in.	in.	in.	in.	in.	in.
Pressure	29·974	30·011	30·047	30·001	29·950	29·925	29·955
Daily Range	0·102	0·136	0·132	0·106	0·140	0·116	0·104
Mean Temperature	78°·2	76°·6	75°·5	77°·7	78°·0	80°·2	80°·6
Maximum	89·0	87·1	87·0	91·0	91·0	94·0	96·5
Minimum	....	68·5	67·0	66·5	67·0	68·0	65·0
Daily Range	....	11·1	13·3	15·8	14·1	18·8	22·4
Relative Humidity..	85	89	91	95	97	96	94
Days of Rain . . .	11	16	6	6	13	7	3
	in.	in.	in.	in.	in.	in.	in.
Rainfall	11·75	15·97	1·34	1·82	17·33	1·97	10·14

The wind was SW from June to November; violent in July, sometimes lasting until night. July was very wet, the sky almost always overcast; no thunderstorms in July and August. On the 17th September the Harmattan began; a very cold dry wind from the NE.

On the Harmattan, tornados, and on the climate of this coast generally, many observations will be found in Dr. Horton's book, 'Physical and Medical Climate and Meteorology of the West Coast of Africa. London, 1867.'

St. George, Elmina.—5° 5′ N Latitude. 1° 20′ W Longitude. Height above sea level 59 feet.

Month.	Atmospheric Pressure.		Temperature.				Elastic Force of Vapour.	Relative Humidity.	Rain.		Number of	
	Mean.	Monthly Range.	Mean.	Daily Range.	Mean of the Highest.	Mean of the Lowest.			Amount Collected.	Days it Fell.	Thunder-storms.	Tornados.
	In.	In.	°	°	°	°	In.		In.			
December	29·875	0·193	80·4	10·4	86·7	71·1	0·862	83	1·42	4·0	4·3	1·7
January	·871	·232	79·7	10·6	85·8	68·5	·850	83	0·04	2·0	1·0	0·7
February	·851	·189	80·8	10 3	87·3	71·6	·890	84	1·93	4·0	2·0	2·0
March	·842	·189	81·7	10·6	88·2	72·1	·898	82	1·89	4·0	3·7	1·3
April	·851	·173	81·5	11·7	89 1	70·0	·898	83	3·23	7·3	1·3	3·7
May	·882	·173	80·6	11·7	87·8	70·5	·882	84	7·40	13·7	4·3	0 7
June	·941	·165	79·2	10·8	86·7	70·5	·874	85	6·73	11·3	2·7	0·0
July	·985	·130	76·8	8·8	84·0	68·9	·799	87	1·69	6·3	0·0	0·0
August	·981	·142	75·0	9·2	81·9	66·7	·772	89	1·06	7·3	0·0	0·0
September	·945	·161	75·6	9·0	82·8	67·8	·791	89	0·91	8·0	0·0	0·0
October	·902	·158	78·6	9·9	85·1	70·5	·835	85	2·36	7·3	5·0	0·3
November	·871	·181	80·6	10·4	86·0	71·4	·854	82	2·13	7·0	6·3	2·0
Year	29·900	0·315	79·2	10·3	89·1	65·1	0·850	85	30·79	82·2	30·6	12·4

CHRISTIANSBURG.—5° 36′ N Latitude. 0° 10′ W Longitude. Height above sea level 66 feet.

Month.	Atmospheric Pressure.			Temperature.			Rain.		Sky. Days per cent.			Thunderstorms.	Tornados.
	Mean.	Daily Range.	Monthly Range.	Mean.	Mean of the Highest.	Mean of the Lowest.	Amount Collected.	Days it Fell.	Clear.	Half Covered.	Overcast.		
	In.	In.	In.	°	°	°	In.						
December	29.851	0.098	0.248	81.1	94.1	71.1	0.51	2.1	0.60	0.33	0.07	7.8	1.6
January	.863	.106	.228	80.6	94.1	70.9	1.06	1.3	.70	.24	.06	4.0	0.9
February	.839	.102	.228	81.7	93.9	71.4	2.17	2.3	.62	.32	.06	5.6	1.7
March	.827	.102	.224	82.8	96.3	70.7	1.46	4.3	.57	.35	.08	10.8	3.5
April	.835	.102	.217	83.1	97.5	69.4	5.63	5.5	.56	.35	.09	10.8	3.4
May	.875	.095	.205	82.6	98.4	70.9	5.63	8.8	.45	.38	.17	7.6	4.5
June	.938	.083	.217	79.2	94.6	70.0	2.01	10.7	.30	.36	.34	2.7	1.2
July	.973	.087	.193	77.0	88.5	68.9	0.39	5.7	.33	.33	.34	0.0	0.1
August	.957	.098	.228	75.6	90.0	67.6	0.67	5.3	.28	.33	.39	0.2	0.0
September ..	.918	.114	.252	77.9	90.7	69.8	1.73	6.7	.26	.43	.31	3.2	0.4
October......	.882	.102	.221	80.6	95.4	70.2	0.71	5.2	.36	.52	.12	7.2	2.3
November ..	.863	.098	.217	81.9	99.3	71.8	0.67	2.6	.62	.34	.04	5.3	1.6
Year	29.885	0.099	0.398	80.3	100.0	67.6	22.64	60.5	0.45	0.37	0.18	65.2	23.9

Donations received from October 1st to December 31st, 1873.

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Brussels	Observatoire Royal......	Annales: 1872, April, May; 1873, April, May. By M. Ad. Quetelet, Director.
Christiania....	Kongelige Norske Universitet.	Norsk Meteorologisk Aarbog, 1872. By Prof. H. Mohn.
Copenhagen ..	L'Institut Météorologique Danois.	Observations at various Stations: 1873, Sep. to Nov.
		Vegledning til Benytelsen af det Meteorologiske InstitutsDagligeVejrmeddelelser, med 12 lithograferede Vejrkaart, Udarbejdet af N. Hoffmeyer. By Capt. N. Hoffmeyer, Director.
Cracow	K. K. Sternwarte........	Meteorologische Beobachtungen: 1873, Sept., Oct. By Dr. F. Karlinski, Director.
Fiume........	I. R. Academia di Marina	Meteorological Observations: 1873, June to Sept.
Geneva	Société de Géographie ..	Le Globe, tome xii. livraisons 1-3.
Greenwich	Royal Observatory	Results of the Magnetical and Meteorological Observations, 1871. By Sir G. B. Airy, K.C.B., Astronomer Royal.
Klagenfurt	Observatory	Meteorologische Beobachtungen: 1873, Sept., Oct. By Dr. J. Prettner.
Lisbon	Royal Academy of Sciences	Jornal de Sciencias, Mathematicas, Physicas e Naturals, tomo iii.
	" " ..	J. H. Lambert, Supplementa Tabularum Logarithmicarum et Trigonometricarum auspiciis Almæ Academiæ Regiæ Scientiarum Olisiponensis cum versione introductionis germanicæ in Latinum sermonem, secundum ultima auctoris consilia amplificata. Curante Antonio Felkel.
Liverpool	Literary and Philosophical Society.	Proceedings, No. xxvii.
London	General Register Office ..	Weekly Returns of Births and Deaths: 1873, Nos. 39 to 51.
	" ..	Quarterly Returns of Marriages, Births, and Deaths: 1873, Sept. 30. By the Registrar General.
	Meteorological Office	Daily Weather Report and Charts.
	"	Notes on the Form of Cyclones in the Southern Indian Ocean, and on some of the Rules given for avoiding their centres. By C. Meldrum, M.A., F.R.A.S.
	"	Bericht über die Verhandlungen des Internationalen Meteorologen Congresses zu Wien.
	"	Report of Committee on Science Lectures and Organization, to the British Association. By the Meteorological Committee.

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	Society of Telegraph Engineers.	Journal, Vol. ii. No. 4.
Manchester ..	Literary and Philosophical Society.	Proceedings, Oct. 7 to Dec. 2, 1873.
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Paris	Observatoire National ..	Bulletin International. By M. U. J. Leverrier, Director.
	Observatoire Physique, Central de Montsouris.	Bulletin Mensuel, Nos. 21, 23. By M. Marié Davy, Director.
Rome	Ministero di Agricultura, Industria e Commercio.	Meteorological Observations at various stations, April, 1873.
	Osservatorio del Collegio Romano.	Bulletino Meteorologico, Sept. to Nov., 1873. By Padre Secchi, Director.
Sydney	Observatory	Meteorological Observations made at the Government Observatory, Sydney, during April to June, 1873. By H. C. Russell, B.A., Government Astronomer.
Toronto	Education Office	Journal of Education, Sept. to Nov., 1873. By Rev. E. Ryerson, D.D.
Upsala	Observatoire de l'Université.	Bulletin Météorologique Mensuel, Vol. v. 1-9. By M. H H. Hildebrandsson, Director.
Vienna	K. K. Centralanstalt für Meteorologie und Erdmagnetismus.	Beobachtungen, Sept. to Nov , 1873. By Hofrath Dr. C. Jelinek, Director.
	Oesterreichische Gesellshaft für Meteorologie.	Zeitschrift, Band viii., No. 19-24.
Washington ..	War Department........	Daily Bulletin of the Signal Service, U.S.A., with the synopses, probabilities and facts, September, 1872. By Brigadier Gen. A. J. Myer, Chief Signal Officer.

Presented by Individuals.

Bianconi, G. A.	Di una antica comunicazione Fra Il Mediterraneo e l'Atlantico pel Golfo di Guascogna, Memoria del dott. Gian Antonio Bianconi.
Delaney, John	Meteorological Observations taken at St. John's, Newfoundland, Sept. to Nov., 1873 (M.S.).
"	Weather at St. John's, Newfoundland, Nov. 1854 (M.S.).
"	Weather at Harbour Green, Newfoundland, Nov. 1873 (M.S.).
Forbes, Arthur..........	Meteorological Summary, Culloden, Inverness, Sept. to Nov., 1873 (M.S.).
Higgs, Rev. W., L.L.D. ..	"The Telegraphic Journal and Electrical Review," No. 16, 17, 19-21.
" " ..	The Telegraphic Journal Almanac, 1874.
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Laughton, J. K., M.A., F.R.A.S.	Physical Geography in its relation to the Prevailing Winds and Currents. By John Knox Laughton, M.A.
Mackenzie, J. I., M.B. ..	Meteorology of Sidmouth in 1872. By J. I. Mackenzie, M.B.
Perigal, H., F.R.A.S.	Perigal's Contributions to Kinematics.
Poëy, André	Nouvelle Classification des Nuages, suivie d'instructions pour servir à l'observation des nuages et des courants atmosphériques.
"	Recherches expérimentales sur la Polarisation Atmosphérique observeé sous le ciel tropical de la Havane.
"	Sur les rapports entre les taches solaires et des ouragans des Antilles, de l'Atlantique nord et de l'Océan Indien Sud.
"	Sur la loi de l'évolution similaire des phenomènes météorologiques
"	Rémarques sur les colorations ozonoscopiques obtenues à

	l'aide du réactif de Jame (de Sedan) et sur l'échelle ozonométrique de M. Berigny.
Poëy, André	Sur la non-existence, sous le ciel austral, des retours périodiques des étoiles filantes, et sur leur extinction graduelle du pôle nord à l'équateur.
"	Sur le retour unique des averses extraordinaires d'étoiles filantes de Novembre 1799, 1832 à 1833 et 1867 à 1868, sous les basses latitudes et vers l'équateur.
Power, R. E., M.D.	Meteorological Observations at Dartmoor, Sept. to Nov., 1873 (M.S).
Quetelet, Ern.	Sur le Congrès International de Météorologie tenu à Vienne du 1er au 16 Septembre, 1873.
Rawson, Governor	Monthly Returns of Rainfall and Meteorological Observations in Barbados: 1871, Aug. to Oct.; Dec. to 1872, Aug.; Oct. to 1873, Sept.
"	Rainfall in Barbados: 1871, May, Aug., Nov., Dec.; 1872, April, May, Aug., Oct., Nov.; 1873, April, June to Aug.
"	Map of the Daily Rainfall of the Island of Barbados: 1873, Jan. to Sept.
"	Meteorological Observations taken at Binfield, St. Joseph, Barbados, 1871.
Sawyer, F. E.	Meteorology of Sussex: 1872, Jan. to Aug, Oct., Nov.; 1873, March to Oct.
Scarpellini, Caterina	Poche Parole sulla presente carta Grafica della epidemia del vajuolo in Roma dall' Ottobre, 1871, al Guigno, 1872, e suoi rapporti coll' Ozono Atmosferico di Caterina Scarpellini e di Paolo Peretti.
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"	Principles of Physics and Meteorology. By J. Muller.
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"	The Climate of Worthing. By W. G. Barker, M.B.
"	Observations on the Weather. By John Toplis, B.D.
"	Observations of the Aurora Borealis from Sept. 1834 to Sept., 1839. By Robert Snow.
"	British Association Reports on Underground Temperature, 1869-1871.
"	Principles of Weather Forecasts and Storm Prevision. By R. Strachan.
"	Commission Hydrometrique et des Orages de Lyon, 1867.
"	Weather Facts and Predictions. By G. F. Chambers.
"	Results of a Meteorological Journal kept at Uckfield, by C. L. Prince: 1850 and 1860.
"	Supplement to the Monthly and Quarterly Returns of the Births, Deaths, and Marriages registered in Scotland during the years 1867-69.
"	Quarterly Returns of the Births, Deaths, and Marriages registered in the divisions, counties, and districts of Scotland; 1871, Dec. 31; 1872, Dec. 31; 1873, March 31 to Sept 30.
"	Averages of the Monthly and Yearly Rainfall in Barbados, for series of years, varying, at different stations, between 1847 and 1869.
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"	'Food Journal,' Nos. 45-47.
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"	'Public Health,' No. 10.
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QUARTERLY JOURNAL

OF

THE METEOROLOGICAL SOCIETY.

VOL. II. No. 10.

Address delivered by the President, ROBERT JAMES MANN, M.D., F.R.A.S., *at the Annual General Meeting, January 21st*, 1874.

At the close of the current Session, the Meteorological Society will be approaching very near to the time when it may celebrate its Silver Wedding, having been first associated, as a reorganised Society, in the bonds of good-fellowship, early in the year 1850. Its half-way halt in this period of nearly a quarter of a century's progress was marked by the presidency of one who has but recently been taken from his place in our councils by the hand of death, and whose presidential rule may therefore be spoken of as the transition era of our history. My colleagues here will, I am sure, bear with me if upon this occasion I use the opportunity my position affords me, to pay the tribute of a passing word to the memory and name of Nathaniel Beardmore, who was so long, so steadily, and so intimately connected with the progress of the Society. In consequence of the growing pressure of heavy professional responsibility and work, and of the accident of a distant residence, Mr. Beardmore's face has not been so frequently seen in its accustomed place at later meetings, as in earlier days. But it must be familiarly known to most of the Fellows, as it is to myself, how constant and real was, nevertheless, the interest he took in their proceedings to the end, and how warm and deep was the sympathy he had for meteorological investigations of every class To those who were his personal and more intimate acquaintances, however, the remarkable combination of geniality and earnestness, will be the characteristic by which he will be remembered. Strong and sound in all he did that involved scientific method and attainment, his intercourse with men was nevertheless marked by a gentle playfulness and ever-flowing humour which are not common attributes with those who are trained in the discipline of grave study and laborious thought, but which for

that very reason constitute a stronger attraction and charm when, as in this case, they are so combined with other traits as to make up a character of marked originality. Mr. Beardmore's too sudden and too early removal from the labours of a distinguished and useful life will be regretted by the compeers who were acquainted with his attainments, especially as an hydraulic engineer, and who were competent to appreciate excellence in that department of high intellectual activity. It will be sorrowed for by the friends who experienced the light and glow of his intimacy and companionship.

The British Meteorological Society was formed in the year 1850,— in some measure, I believe, from the débris of an older Society, which was itself instituted as far back as 1823,— and printed its first papers about the year 1837. Mr. Beardmore's presidency occurred in the years 1861 and 1862. In the first of these two years, which I have ventured to allude to as the transition epoch of our history, the commencement of Mr. Beardmore's rule was marked by the formal establishment of regular and periodically issued "Proceedings." A volume of Transactions had been issued in 1839 by the older Society, which was known under our own *corporate* name of "Meteorological Society," and two parts of a small volume printed as Gutch's Quarterly Journal of Meteorological Science were afterwards published in 1843 under the avowed acceptation and patronage of the same Association. But from the year 1850, in which our own Society was called into existence as the British Meteorological Society, until the time of Mr. Beardmore's presidency, all communications were printed merely as additions to the annual Reports; and it is matter of some personal interest to me that the first-born of these primitive, or primeval, communications related to the work of a gentleman with whom I have since been intimately and pleasantly associated in public work on the other side of the world. The first formal record printed by our Society was an abstract notice of "A Meteorological Register kept on board H.M. Ship 'Sophia' in Arctic Regions," by P. C. Sutherland, since then, and now, the Surveyor-General of the colony of Natal. The first article printed in the regularly issued Proceedings was Mr. Beardmore's inaugural address from the presidential chair in 1861.

In this address there occur two passages to which I wish, after this lapse of time, to recal attention, on account of the bearing they have upon a topic, concerning which I propose to say a few other words. In the first of these passages, Mr. Beardmore remarks upon its having been the great object of the first promoters of this association to make it an instrument for the collection of strict and scientific data, because it is only through the observation, record, and collation of such data that the "first causes" of observed phenomena can be reached;—and in the second paragraph he dwells upon the paramount importance of having a well-planned and well-considered distribution of stations, rather than a heterogeneous mass of "voluminous multifarious returns," for the advancement of synchronous meteorology;—that is, the observation and comparison of atmospheric conditions and effects at identical instants of time over large areas, in order that underlying causes of difference may be discovered through comparison.

It has been one consequence of the vast multiplication of observers in recent years, and of the rapid growth of these "voluminous multifarious returns," without correlative regard for the organisation of synchronous systems of observation, that the fashion has arisen, even amongst scientific men, to point the finger of incredulity and reproach at the labour of meteorologists. In an article printed in a recent number of a high-class and largely read monthly periodical,* Sir William Herschel is quoted as having described the meteorologist who endeavours to interpret the laws of weather, as being much in the position of a man who hears unconnected fragments of a long prosy history related, without having the opportunity to ask for the missing links of the confused narrative which alone could make its purpose intelligible. The Astronomer Royal is also quoted as "not being able to hazard a conjecture as to whether the effect of the increase of meteorological observatories will be that millions of useless observations will be added to the millions that already exist, or whether something may be expected to result which will lead to a theory." And Professor De Morgan is referred to as speaking of meteorological observations as an attempt at induction which has yielded little or no fruit.

I allude to this subject, upon this occasion, because I entertain a very clear and strong conviction that the not infrequent remarks of this character are due to a radical and, under the circumstances, somewhat surprising misapprehension of the primary aims of meteorological science, which it may be well to endeavour to set right. There can be no doubt that a "meteorological theory" is a thing to be ardently desired, if that mean any thing of the same kind as the sublime theory of gravitation which forms so large a part of the Astronomer Royal's intellectual day-dreams, and which, in all probability, was the suggestion in his mind when he made the passing allusion which is one of the subjects of quotation; and systematic and synchronous observations are legitimately aimed that way. But it cannot be too strongly urged that the establishment of a comprehensive theory;—or that other piece of work which is the popular and familiar expression of the reproach, namely the foretelling of the weather,—is not the sole, or even the primary, object of meteorological labour. The first aim of scientific meteorology is the study and investigation of the facts of climate, rather than the establishment of a theory;—the examination of the way in which the physical conditions of any given spot on the globe that is inhabited by a human community, affect the reception and retention of solar heat, the production of wind currents, and the ordering of rainfall;—and these are facts which are of the very highest interest, in themselves, in their actual practical bearing upon human welfare, and which, I submit, are certainly made out through careful observations and comparisons. But even beyond this, it should also be remembered that the meteorologist encounters, at every turn of his practical labours, the most admirable and advantageous opportunity for investigating nature's mode of dealing with the molecular conditions and forces that are in incessant play

* Saint Paul's Magazine, July 1873. "The Weather and the Sun."

and operation in the mobile atmosphere, which is so essentially the physic basis of organic life. The meteorologist finds in the magnificent laboratory nature—the wind-driven and cloud-capped air,—alembics, and furnaces, an induction coils, that are maintained upon the grandest scale of constant actio and that he has only to watch systematically and closely from day to day, he would read the more secret mysteries that lie in evaporation, and aqueou deposit, and gaseous movement, and if he would understand the method c procedure through which the so-called forces of light, heat, electricity an chemical energy, carry on their appointed task of evolving life from material elements. The yet further interest that attaches to the opportunity which is given for the application of mechanical principles in the construction and improvement of instruments of observation, is too obvious to need more than the most cursory mention. If it be true that in past times a prosy history has been related without due regard to the links of its connections, and the continuity of its thread of meaning, I submit that it is by no means to meteorological investigation alone among the sciences that that reproach applies. If, further, it be true that millions of useless observations may yet be added to millions that have been already made without leading to a theory —and that meteorological observation is an attempt at induction which has yielded little or no fruit—even that, I submit, would by no means establish the case that meteorological science has not its fertile field of most useful and honourable realisation, any more than the millions upon millions of experiments of the alchemists could have proved by their failure that there was no science of chemistry, or than the millions upon millions of calculations of the astrologists of pre-Copernican days could have proved by their barrenness that it would be waste of national effort to build an astronomical observatory upon Greenwich Hill. In the study of climate, and in the investigation of the subtle operations of the natural forces that dwell in the atmosphere, and that have their haunts and their workshops amid the winds and dews, and in the rains and clouds, the meteorologists have a large and noble field of daily labour, and to that interesting daily labour they may continue to devote their minds and energies, without dwelling too anxiously by anticipation upon the final end. In all such work, more comes at the last than is ever bargained for at the first. Even in regard to the "millions upon millions" of observations, the Astronomer Royal has well said, that with all his large experience in such matters, he cannot hazard a conjecture whether something may not be expected to result which may lead to a theory. For myself, in all due humility I do, without one moment's hesitation, hazard something more than a conjecture that out of meteorological investigation, taken as a whole, many things will result which will contribute in a very material degree to man's knowledge of the laws of nature, and to man's powers over the so-called natural forces and elements.

In Mr. Beardmore's address, at the half-way of our history, he, the then President, enumerated the main features that were to be regarded as the landmarks of recent progress in the history of meteorological science. The chie topics which came within this enumeration were—The introduction of pho

tographic record of observations by Mr. Brooke;—the adoption of the method at the observatories of Greenwich, Kew, and Oxford;—the grouping and analysis of the Greenwich observations by Mr. Glaisher;—Dr. Thomson's and Dr. Tripe's investigations into the sanitary meteorology of the metropolis;—the suspected connection of sun-spot periods with the occurrence of auroræ, magnetic storms, and marked earth currents;—the introduction of telegraphic indication of synchronous meteorological conditions through wide areas of distance; and the establishment of storm signals, and the distribution of good marine barometers at leading coast stations. If we return to this idea of the land-marks of progress during the other twelve years that have passed since this enumeration was made, we are at once struck with the fact that in all of these particular departments, selected by Mr. Beardmore for especial notice and commendation, the work has been steadily and unremittingly pursued, and in most of them important and valuable results have been secured. The photographic method of record has been materially extended, and very extensively adopted; and at the same time has been made more exact. The meteorological staff of the Royal Observatory is still busy with the discussion and classification of the Greenwich observations from 1848 to 1868. That the influence of meteorological conditions upon the health of the community residing within the metropolitan area is still being intelligently watched and investigated, has been excellently and admirably shown by the very recent address of the ex-President of the Society, Dr. Tripe, with which the Fellows of the Society are familiar. The development of telegraphic notices of atmospheric conditions over a wide area of land has been so largely extended, that at the present time the whole of the United States of the North American continent are enclosed for this purpose within a network of electrical intercommunication, and our own Meteorological Office, in Victoria Street, stretches its telegraphic fingers and eyes over the whole of France, to the shores of the North Sea and the Baltic in one direction, and to Corunna, a natural and most important outpost on the Atlantic, in the other. Storm signals are now displayed at 120 selected stations around the British Isles, and there is considerable probability that the system of Admiral FitzRoy, which gave indications, by a cone, of the direction in which storm impacts are to be looked for, will be shortly resumed. At this instant, 118 barometers of standard excellence, belonging to the Meteorological Department, are maintained for the use of fishermen at important coast stations, besides the very large number of similar instruments that have been supplied by the National Life Boat Institution.

The remaining illustration of Mr. Beardmore's address, the suspected connection of sun-spot periods with electrical, magnetic, and atmospheric phenomena upon the earth, I purposely pass by upon this occasion, not because it has not been pursued as a worthy subject of investigation, but, on the other hand, because it has already become so large, so important, and so interesting a theme, that it would not be possible to give it adequate attention now, in connection with the numerous other topics that have necessarily to be named, and because I hope to have the opportunity to return to it upon another and more suitable occasion.

In speaking of the early passages of our history, I have alluded to our now inscribing upon our banner the device which was originally borne by an older Society although we commenced our own individual existence, I believe, to establish our distinction from that Association, as the British Meteorological Society. It will hardly be necessary, so far as my immediate hearers are concerned, that I should say the change of our designation to the more venerable title of "Meteorological Society" was made in the year 1866, when we were incorporated by charter, and therefore marks the era of our corporate birth. The regular issue of our Proceedings, which I have alluded to as commencing with Mr. Beardmore's mediæval presidency, was continued steadily beyond this time, until five volumes were complete. The form of the publication was then once again changed, for reasons of convenience, into that of the "Quarterly Journal," which is still issued to the Fellows. The Society was largely indebted, in the first instance, to Mr. Charles V. Walker, and then to Mr. Glaisher, for the arranging and editing of the first volumes of its Proceedings. The Quarterly Journal is, for the present, under the control of an editing committee. These are little matters that are "household words" among the greater part of ourselves; but I think it is well to give them this passing notice, because new Fellows who are now joining themselves to our ranks, from time to time, are without the advantage we possess in this familiarity with our traditions.

In dealing as cursorily as I have done with the series of illustrations of progress and promise adopted by Mr. Beardmore, I desire, as will perhaps have been observed, especially to mark the sagacity of the selection, which took, in every case, instances of work that have stood the test of an additional twelve years of persistent labour, and that still hold the field as successful and practical branches of meteorological study Having allowed myself the pleasure of saying so much, I proceed to add to the sketch of landmarks, certain other bold headlands that have since loomed upon our sea-line from time to time as we have prosecuted our onward voyage, and I think I shall best contribute to the general interest of this addition if, in doing so, I especially select those particular instances of investigation and intellectual deduction that have had the strongest attraction and charm for my own mind.

The establishment of the connection of the movement and force of the wind with the indication that is now so expressively named and known as the barometric gradient, always appeared to me one of the most interesting of the broad generalisations of meteorological science. This connection was just on the point of coming into notice when Mr. Beardmore's address was read. Professor Buys Ballot, of Utrecht, propounded his views on the subject, which had, however, been previously printed in a Dutch pamphlet, at the Newcastle meeting of the British Association for the Advancement of Science, in 1863. Mr. Thomas Stevenson, the civil engineer, has at least the credit of having, in 1867, suggested the admirable term "Barometric gradient," which has since become an integral element of the expression of the law; and in the following year, our Foreign Secretary printed his "Inquiry into

the connection between strong winds and barometric differences." Mr. Scott, however, has pointed out to me a passage in a somewhat rare book, entitled, "The Recurring Monthly Periods of the Atmospheric Actions," by Mr. Webster, a Navy Surgeon, which was published as early as 1857, in which there is an unmistakable recognition of the essential base of Buys Ballot's law. In this passage Mr Webster says, "A difference of one inch between the barometers of Greenwich and Orkney, 500 miles apart, would produce a breeze of perhaps 9 or 10 pounds pressure; but if a difference of two barometers, at 250 miles apart, amounted to one inch, the pressure, or force of wind, would be 16 or 20 pounds on the square foot." There is here an unquestionable suggestion of the great leading idea that the movement of the wind is primarily due to the very same cause that establishes the draft through the fire and chimney of the domestic hearth, - namely, the difference of weight in balancing columns of the atmosphere; and that the movement of the air is substantially from the place of greatest towards the place of least aerial pressure. Why it is that the actual movement of the wind is transverse, or inclined, to the direct line connecting the places of observation together, and with the station of lowest pressure on the left hand of its course, is the point of the law which is still most stimulating to further inquiry, and which in all probability holds the last deep mystery of the whirlwind which has yet to be tracked to its hidden layer; but which we may fairly infer is due in some measure to the differential, or compared, observations, in the great majority of instances that come under discussion, lying out of the line that most directly connects the foci of high and low pressure,—to those foci being themselves in a state of transference, - and to the movement which results when the higher pressure is obeyed being of the character of an eddy. The great fact which underlies the somewhat complicated effect is, I conceive, none the less absolutely,—when reduced to its simplest form of expression,—that an aerial fluid of necessity moves under the influence of gravitating force, from a position of high, to a position of low pressure. In a small pamphlet, printed in the same year as Mr Scott's inquiry, under the title, "Principles of Weather Forecasts and Storm Prevision," Mr. R. Strachan, an active Fellow of the Society, reduced the law, by which the direction and force of the wind at any station may be inferred from observations of the barometer, to a simple and intelligible mathematical expression. In this pamphlet, the fact that the chief force of the wind is experienced midway between the spots of high and low pressure is brought prominently into notice as a natural corollary of Buys Ballot's law, and the way in which the movement of the wind in England is connected with the atmospheric pressures in circumambient areas is formulated in a series of lucid rules, which, I believe, are in the main those which have been for some time acted upon in the forecasts of the Meteorological Office, a department to which Mr. Strachan belongs. The yet recent investigations of Dr. Carpenter into the phenomena of deep oceanic currents, obviously go far to warrant the conclusion that this same influence dominates the waters of the sea, as well as the overlying atmosphere, and that there is a great, constant, and uninter-

mitting vertical circulation of water between the polar and equatorial oceans, which is essentially but a transfer of the liquid from regions of high, to regions of low pressure, and that this circulation is caused and maintained by the mere differences in specific gravity incident to diversities of temperature, wherever there is open and free communication between the deep polar and equatorial seas. In all probability, there is a submarine, as well as a barometric gradient, whose case has yet to be fathomed in connection with the deep-sea casts of the 'Challenger' in its mid-ocean routes; and we may look yet to have a "Carpenter's rule," as well as a Stevenson gradient, added to the appliances of our meteorological tool-box.

Having thus been led by the natural set of the current of my subject into the region of the great ocean, I now find myself caught in the Doldrum squares of our indefatigable colleague, Captain Toynbee, whose researches in this direction are of unsurpassed interest and of such admirable promise. You are all aware, that as Marine Superintendent of the Meteorological Office, he recently found himself in a position to deal with some 125,000 observations abstracted from ships' logs for the mid-region of the Atlantic that lies between the parallels of 20 degrees north and 10 degrees south latitude, and that he set himself earnestly to the work of answering practically the accusation that meteorological observation is an attempt at induction which does not yield fruit, by showing that out of those 125,000 observations, a comprehensive rule for mid-atlantic navigation may be compiled. In the first instance, he divided the central heart of this region —the Doldrum tract, where the pulsations of the winds faint and fail into the inter-tropical and inter-trade-wind upcast,—into 100 subordinate 1-degree squares, into which he condensed with almost pictorial clearness and force the leading characteristics of the winds and currents for each month of the year. The continued prosecution of this plan, and the further consideration of the first experimental conception for these charts, has led to the very happy adoption of larger subordinate sub-divisions for the expression of the leading features. The Doldrum charts are now constructed with the central 10-degree square of the region subdivided into 2-degree squares, so that there are 25, instead of 100, pictorial squares to embrace in the eye glance. The result is that the most prominent and important characters are brought out into four-fold boldness and force, while all subordinate conditions and records are still referred to their proper 1-degree squares for more exact and definite study in case of need. The contrivance by which, in each of these squares, the occurrence and proportion of calms, and the prevalence and force of the different winds, for each different season and month of the year are expressed by arrows and shaded segments of the circular area, so that they can be at once caught by the eye, is exceedingly effective, and deserving of the highest appreciation and praise. It would, as a matter of course, be premature to say any thing as to generalised results in reference to a work that is so large, and so essentially new, as this interesting labour of Captain Toynbee's, but it is quite worthy of note that a conviction seems to be growing upon his mind that the Doldrums of the mid-ocean space of the

Atlantic have more to do with the weather changes of England than has hitherto been supposed; and I would also draw somewhat pointed attention to his conception that, as there must be two high tempers and a difference between (as he has very characteristically expressed it) to make a quarrel, so there must be two high pressure areas, with a low pressure space between, to make a hurricane; and also to his deduction from the actual indications of his charts that any given difference of barometric pressure - such as the hundredth of an inch for a distance of 50 miles - gives a much stronger wind in the inter-tropical region than the same barometric gradient gives in England.

When Mr. Meldrum was in London in the year 1868, I had the opportunity of conversing with him at some length about his plans for mapping meteorologically the Indian ocean from log records, according to what, I believe, was the proposal of M. Le Verrier, that the English meteorologists should deal with the Indian and Pacific oceans, while the French took charge of the Atlantic. It is matter of some satisfaction to see that he is prosecuting this work very successfully, and to mark that he thinks he has found a lead which will to some extent modify the hitherto accepted interpretation of the cyclone. The practical point of Mr. Meldrum's deduction is that the vessel that runs directly in the course of a storm, may be running as directly into the centre, or heart, of the hurricane. This is obviously a matter of such high moment, that we must all look with the utmost sympathy and anxiety to the further prosecution of Mr. Meldrum's labours.

It is very generally known that about the year 1854, Mr. Le Verrier conceived the idea of constructing daily weather charts from the telegraphic communications of the most prominent and conveniently placed meteorological observatories. There is some reason for the belief that a similar notion had occurred at even an earlier date to the meteorologists of the United States of America. One of the earliest allusions to the orderly, and, therefore, prognosticable, progress of storms occurred upon a map of Pennsylvania and neighbouring states by Lewis Evans, printed at Philadelphia in 1747 or 1749, in which the remark occurs that the great storms of that region began to leeward, and move so that they are a day sooner in Virginia than in Boston. Allusion is made to this remark in Mr. Scott's translation of Dove's Law of Storms, and Mr. Scott has also pointed out that the same statement is quoted in T. Pownall's Topographical Description of the British Colonies in North America, printed in London in 1776. There is, however, unquestionable ground for the statement that Franklin was the first to suspect this orderly movement in consequence of an eclipse of the moon, which occured on October 21st, 1743, and which was concealed by a storm at Philadelphia, having been visible at Boston because the storm had not arrived there at the time of the occurrence. Professor Cleveland Abbe, of the Cincinnati Observatory, has given a very interesting resumé of the part taken by France, England and the United States respectively in developing the system of weather telegraphy. Kämtz, of Halle, availed himself of the daily journals to indicate the hourly progress of remarkable storms as early as 1835. From 1830 to 1855 the

idea of possible weather telegraphy was continually recurred to in the United States, especially by Professor Henry of the Smithsonian Institution, who in 1847 spoke, in the annual Report of the Institution, of the services that could be rendered by the telegraph in diffusing storm warnings. In 1854 Le Verrier was at work on the subject in Paris; in 1855 signals were communicated from place to place in France, and in 1857 foreign stations were included in the system. On January 1st, 1858, the publication of the 'Bulletin International' was commenced, and in 1863 the French system of daily publication of forecasts was matured. In 1865 the system was taken up by the French Marine Department. Storm warnings were issued by Buys Ballot in the Netherlands in 1860, and by Admiral FitzRoy in England from 1861 to 1865. The system was soon after that extended to Italy, India and Australia. The Meteorological Office of the Board of Trade recommenced its weather signals, after a year's suspension, in December, 1867. Professor Abbe issued the first weather bulletins of the Observatory of Cincinnati on September 1st, 1869, and the work was handed over to the Chief Signal Officer of the Army Department of the United States early in the year 1870. The idea of the daily issue of weather charts, expressing the leading features of concurrent meteorological conditions over large areas, has been quite recently seized upon and very admirably extended by our own Meteorological Office, under a plan which provides for the transmission of the charts to regular subscribers, who are therefore necessarily persons who give a pledge of interest in their indications. It will not be deemed a remark of unmeaning superfluity, if I place by the side of the allusion I have already made to a quotation of the Astronomer Royal's opinion upon the value of meteorological records, what he has added upon a public occasion about these weather charts. In his address last month as President, at the anniversary meeting of the Royal Society, he said, "Daily charts are now issued on a highly extended plan by the Meteorological Office, and circulated among a large list of subscribers. I think that comparison of the records of the various atmospheric elements upon these charts, continued from day to day, would be more likely than any thing yet published to throw light upon the difficult question of causes and effects in meteorology."

It is a notable and instructive confirmation of some things which my predecessor in the presidential chair so well said on the subject of the influence of meteorological science and conditions upon the health of the community, that immediately after the prevalence of the remarkable and long-continued fog of the last month in the metropolitan district, the death rate rose to a higher point than it has attained since the severe visitation of cholera in the year 1866. The dense fog continued over London from Tuesday, December the 9th, to Saturday, December the 13th. The death rate for the metropolitan area of 118 square miles, for the week ending December 6th, was 23 in 1000. In the following week, when the fog prevailed, it was 27 in 1000. But in the next week, when there had been time for the deadly effect to produce its full influence, the death rate rose to 38 in 1000. The deaths from respiratory diseases in the metropolitan area, during these

three weeks, were severally, 520, 764 and 1112, therefore there could be no doubt as to the immediate and actual influence of the atmosphere in bringing about the result. There is, however, one other fact that I desire to draw into prominent notice. The prevalence of the fog was coincident with a very low temperature; and the cold, no doubt, produced its usual effect in increasing the death harvest. But the influence of the cold was very much less than the influence of the fog. The mean of the deaths in London, where there was fog and cold, for the two weeks ending December 20th, gave an increase of 41 per cent. upon the mean of the preceding week; but the corresponding mean for the same two weeks in 17 large towns of England, which had the cold without the fog, gave an increase of only 8 per cent. for each of those weeks over the first week of the month.

No record of landmarks of meteorological progress during the period that is under review, could possibly omit to notice the one high hill which has become the beacon of British rainfall. It will be remembered, that in the year 1863, our Secretary, Mr. G. J. Symons, had managed to interest 700 observers in the British Isles, and to organise them into a gallant band of meteorological volunteers. A part of the good work of that time, was the facilitation of the distribution of reliable gauges through a grant of the British Association, and I believe also the inducement of the instrument makers to construct trustworthy instruments at low price. At the present time, Mr. Symons' band of volunteers has grown from seven, to nearly seventeen, hundred; and his organisation and discipline of this large staff of observers has been proceeded with as steadily as the numbers have augmented. It certainly is a very remarkable instance of devotion to science, and ability to communicate an enthusiasm for its pursuit to other men, that a single individual should have been able to enlist the efficient co-operation of such a staff of unpaid and unflagging assistants. But I conceive that this is, in reality, but a small part of the debt we owe to Mr. Symons. The more important portion of his work has been the steady, and I almost feel tempted to say remorseless resolution, with which he has perfected and checked the methods of his observers, and weeded out weak hands. If there is any dogma that is worthy of respect in our commonwealth, it is the one which continually reminds us that in our particular pursuit no observation at all is better than bad observations. A large series of excellent observations, in this especial work, is in danger of having all its results vitiated, and its conclusions made false, by the mingling of a few black sheep with the white members of the flock. It is not yet time to say much concerning the deductions that are to be drawn from this vast mass of British rainfall observations that we owe to the industry and public spirit of one man; but we may point with some satisfaction to the assumption of a standard mean rainfall for a large series of prominent stations in the British Isles, which is probably as near to the truth as the five-hundredth of an inch in a fall of 25 inches, or one five-hundredth part of the whole; and which is, therefore, well calculated to serve for the present as a zero point in estimating deficiency, or excess. The figures which Mr. Symons adopts as an approximate yearly

average, from a good series of six years' observations, for the entire Britis Isles, are 34·99 inches; the yearly average for London for the same ter being 25·01 inches. The excess over this yearly mean for the wet yea 1872, was 12·26 inches, or 36 per cent., for the entire British Isles; an 8·85 inches, or 35 per cent., for London.

There is one very remarkable and suggestive report for the past year on th subject comprised within our domain, which contains some passages tha allow of notice here, and that have also been alluded to in the address of th Astronomer Royal to the Royal Society. It is the report of the director of th New York Meteorological Observatory, Mr. Daniel Draper. Mr. Draper in clines rather strongly to the opinion that the climate of New York and of th Atlantic States is invariable, even in cycles of short period, and he remark that the duration of the closure of large northern rivers by frost is a bette test of this fact than thermometer indications, and that the frozen period (the Hudson during a term of 50 years was 91 days. Another very startlin and piquant ennunciation of Mr. Draper is to the effect that, of 86 storm dis turbances that were marked on the Atlantic Coast as promising to cross th entire breadth of the great western ocean, and to show themselves on it eastern border, only three failed to put in a proper appearance, and to fulfil th predictions of the meteorologist. It may, perhaps, seem to the most cautiou inquirers that it would be desirable in this matter to have some further evi dence as to the actual identity of these western and eastern Atlantic storms It may, also, be well to take, in connection with Mr. Draper's deduction regarding the freezing of the Hudson, the Russian reports on an analogou subject, namely, the closing of the Volga. From observations made on th ice and water level of the Volga at Astrachan, from 1836 to 1867, Dr Wojeikoff considered that the duration of winter ice on that river had slightl increased from year to year, and that the waters of the stream froze earlie and thawed later as the years drifted on.

It will not fail to be observed by the Fellows of the Society that the ide of the value of international communication and conference has been recentl assuming a marked prominence. The first meteorological conference of an note was that which was inaugurated at the Cambridge meeting of the Britis Association for Science in 1845. In the year 1853 there was a meteorolo gical conference at Brussels, under government auspices, for the discussion (questions connected with marine meteorology; and out of the deliberations (that congress came the suggestions which issued in the establishment of th Meteorological Department of the Board of Trade, under the superintendenc of Admiral FitzRoy, and which proved to be the parent of a lusty offsprin in the Meteorological Office, since carried on under the energetic direction (our Foreign Secretary. The Leipsic Conference of 1872, and the Vienn Conference of 1873, will be fresh in the memory of our Fellows, as will als the part which has been taken at this latter congress by our present Foreig Secretary, Mr. Scott, as the accredited delegate of the Meteorological Societ The chief recommendation for meetings of this class is the freer and healthie breathing that they furnish for minds otherwise trained in national proclivitie

and peculiarities of thought. If it be true that it is advantageous for intellect to come into intercommunication with intellect in the daily transactions of scientific life, it must be even more desirable that the national mind, in its pursuit of each specific branch of high knowledge, shall be subjected to the same healthy and ameliorating discipline, and that the aphorism that science belongs to humanity, rather than to sections of mankind, shall have authoritative acceptation in the widest sense.

But there is, also, an immediately practical bearing of these international councils, as is admirably shown in one of the first fruits of the Vienna Congress, that is already ripened on the tree, and offered to our hand,—the establishment, namely, of a system of daily synchronous observation over the civilised countries of the world. Brigadier-General Myer, of the United States, has taken the initiative in the organisation of this system, and it will have the efficient support of our own Meteorological Office. The hour selected for the daily observation is noon of 11° west longitude, which agrees with 0h. 45m. of Greenwich mean time, and which secures an early and convenient night observation for the United States, and a day observation over the whole of Europe and Africa, and the greater part of Asia.

A proposal, which has since emanated from one of these conferences, that an International Meteorological Society shall be formed, will, probably, be found to stand upon a somewhat different base. There is, on the very threshold of the proposal, the difficulty of conceiving what the proper work of such an international association could be in relation to a branch of scientific pursuit where, from the nature of things, the ordinary expedient of division of labour is inapplicable, and how the action of a permanent parliament of men residing in different quarters of the globe, and for the most part speaking different languages, can in any way produce a more ready and free interchange of thoughts, and more effective and cordial co-operation, than is already secured by the instrumentality of the press, and the circulation of Reports and Transactions. The subject, however, is one that is worthy of further consideration, and should not be settled, even as a mere matter of opinion, without patient consideration of its aims and possibilities.

There is one application of an instrument that is essentially almost a symbol of our science, to correlative work in a noble sister's service and domain, which is so refined and so exquisite in its spirit, that even at the end of a somewhat lengthened address I cannot withstand the temptation to draw your attention to it. It was many years ago ascertained that the swinging movement of a clock pendulum was retarded by increase in the density of the air, and that high states of the barometer were, therefore, associated with slower rates of clocks. Mr. M. Bloxam, who investigated this subject by careful experiment, found the influence upon a very good dead-beat escapement clock amounted to a change of clock rate of one second per day, for one inch of alteration in the column of the barometer. In a communication to the Royal Astronomical Society at the commencement of last year, Mr. E. B. Denison announced that he had been recently examining this cause of irregularity in clock rates, and that he found a perfect compensation for the error

might be provided by the simple expedient of attaching a barometer to tl rod of the pendulum in such a way that the rise of the mercury in the tul of the barometer must exert exactly as much influence in accelerating the ra as the increased pressure of the atmosphere exerts in retarding the rate. M Denison states that the exact size and position of the barometer must b found by experiment for each clock; but that this is very easily accomplishe by tying the barometer to the pendulum-rod by waxed thread, a plan whic admits of ready and repeated renewal and re-adjustment. During his in vestigation of this subject, Mr. Denison found that the Westminster Palac clock, during the year 1872, only reached a daily error of two seconds thre times, the maximum of error on those occasions being five seconds for a da and eight seconds for a week. The average daily variation during that tim was only four-tenths of a second, and, wonderful to say, no part of that erro was due to change of atmospheric pressure, or under the control of baro metric compensation. The pendulum of the Westminster Palace clock is 18 feet rod, weighing 700 pounds and beating 2 seconds. It somewha accidentally happens that the arc of vibration of this pendulum amounts t 2½ degrees, which is somewhat in excess of the ordinary range of the beat o the best astronomical clocks, and Mr. Denison believes that the immunit of this clock from barometric error is mainly due to the circular error, o change of curve, incident to the wide beat exactly compensating the influenc of altered atmospheric resistance, which tells more on the fall of the bob tha on the rise, when an air current has been established, and, therefore, the ai resistance lessened. As the beat of this massive pendulum is diminished b augmented resistance of heavier air, the rate is quickened in an identicall corresponding degree by the influence of the altered form of the more limite swing. The curious investigation of Mr. Denison seems to establish th practical fact, that the rate of a large gravity escapement clock may be ex pected to be considerably better than that of the best dead-beat escapemen clock, and that its barometric error will always be very trifling in compariso with the barometric error of astronomical clocks, and often altogethe neutralised.

It only now remains for me to congratulate the Society upon the prosperou condition of its affairs. It will be seen from the balance sheet that its earl years have been so prudently and so economically managed, that it has, a the present time, a small fund of realised property, a little exceeding £1,200 But I have also the satisfaction of drawing attention to another fact, that I believe to be of still higher importance, namely, that notwithstanding the step which has now been deliberately taken of providing a permanent office and a paid administrative officer, at some yearly cost, a careful estimate of the working of the Society upon its present scale of action, with certain measures of enhanced and desirable economy that have been recently adopted by the Council, shows that operations will be carried on, even if there be no augmentation of means from natural growth, with a margin of a few pounds of yearly income beyond that which is indispensable for current expenditure. In alluding to this pleasant aspect in our skies, it will scarcely be necessary

that I should point out how largely we owe the satisfactory condition in which we stand to the long-sustained and generous hospitality that we receive from the Institution of Civil Engineers, who so kindly furnish us with the ample and luxurious accommodation that we enjoy for the periodic meetings of our Fellows and our Council. It would not be easy to estimate in adequate terms the advantage it has been to our early and half-fledged days to have had the sheltering protection of so warm and strong a wing. The acquisition of an office and library of our own, and of the services of a paid officer, has at length placed us in the position we have so long desired, of being able to enter upon the functions of a more practical scientific life. It will be found that one very material step has been taken in this direction, in the commencement of an organised and arranged library. It is of unquestionable importance that our library shall be made one of standard excellence for all purposes of reference in matters that concern the history and methods of meteorological science, and that it shall have the convenience of a good catalogue at the earliest possible opportunity. Such a library must, of necessity, in our particular case, comprise a very large and valuable proportion of MS. documents, which do not need to be printed, but which require careful preservation, arrangement and cataloguing, even more than printed books, so that they may be available for special investigations and inquiries. This need will now have the careful attention of the Council and the library committee. Committees on various other practical subjects, such as the preparation of standard forms for the record of recognised observations; the consideration of the most desirable kinds of instruments and appliances; and the weighing of sundry matters that have arisen out of the recent conferences at Leipsic and Vienna, or that have been referred to the Society by her Majesty's Commissioners for International Exhibitions, have been formed and are in operation. The question has, also, been entered upon, in connection with some of these committees, as to how far it may be practicable to devise some scheme of cordial and authoritative co-operation with the Meteorological Department of the Government. The proper ground and base of such co-operation seems to be in a large measure suggested by the actual circumstances of the case. There must always, of necessity, be leading branches of meteorological investigation, such as weather telegraphy, storm warnings, and the charting of the great ocean highways, which the hands and resources of a government alone can deal with. But there are, also, of necessity, various matters of secondary weight, but still of high moment, which government action cannot touch, but which a Society like our own, with a very trifling increase of means beyond the revenue we now possess, and under the conditions of a frank and cordial understanding with the Government Department, may most beneficially and effectually take into its care. It would be premature that I should just now say more on this particular theme than will suffice to indicate that it has a place in the deliberative action of the Council, and that it will, most probably, yet come, in some form or other, under the notice of the Fellows. In the mean time, may I venture to hope that you will receive these passing suggestions with indulgence, if not with favour; and

that you will permit me, while speaking of the prosperous state of the Society, finally to add that your Council has fair reason, in our case, to anticipate that prosperity will be made by such instrumentality as I have indicated, the means of largely increased usefulness, and that the largely increased usefulness will bring with it, as such attribute usually does, the further consequence of quickened growth and yet higher aim.

REPORT OF THE COUNCIL,

READ AT THE ANNUAL GENERAL MEETING, JANUARY 21, 1874.

As the Society determined, at the last annual meeting, that its financial and official year should correspond with the civil year, instead of extending from June to June, and also decided that the annual meeting should be held in January, instead of in June, it becomes necessary that the Council should prepare a report of its proceedings and of the general business of the Society up to the end of 1873.

Although so short a time has elapsed since the last annual meeting, a great many important matters have been carried out. In the first place, the President and Secretaries held two meetings, and presented a report on the best plan for carrying on the general business of the Society, and suggested several changes for its more orderly conduct. They advised that the Assistant Secretary should perform many of the duties which have hitherto been carried out under the directions of sub-committees, should be responsible for the proper record of all correspondence, and have the custody of all the books and papers of the Society, and also that he should undertake the duties of the collector and the publisher, so far as relates to receiving subscriptions and issuing the Journal and notices. The Council trust that these changes, which make one person responsible instead of several, will have a good effect as regards correctness, regularity and rapidity in carrying out the future arrangements of the Society.

Another report as to the best mode of keeping the accounts was brought up by the committee to which this matter was referred, and adopted by the Council. The recommendations contained therein were of the same tendency as those of the former report, viz. to throw the book-keeping on the Assistant Secretary, subject to the directions of the Treasurer, so as to enable the Council to ascertain at any time, not only the liabilities and assets, but also the details of the pecuniary position of the Society as regards its Fellows, and which could previously only be procured by application to the Collector and Treasurer. This committee, also, very carefully examined the books of the Society, and made a list of Fellows in arrear, which has been dealt with by the Council, in accordance with the recommendations of the Committee.

Several alterations and improvements have been made in the Society's

room and library, 30 Great George Street, by which it is placed in a more satisfactory condition. Enlarged accommodation has been made to allow Fellows to inspect the instruments, &c., belonging to the Society, and also to read and borrow the books, write letters, &c.

Many valuable additions to the library have been made during the Session by numerous Societies, Institutions and gentlemen, especially Mr. Symons and Captain Toynbee; a complete list of which is published in the Quarterly Journal. A large number of books have been bound, so as to make the library more useful to the reader.

The Council have granted the loan of the Robinson's Anemometer, presented to the Society by the widow of the late Mr. F. Nunes, to Mr. S. H. Miller, of Wisbeach, for use in connection with his experiments upon evaporation.

In the early part of 1873 the Council had under consideration the propriety of ascertaining the opinions of the Fellows as to many important points noticed in the Report of Proceedings of the Leipzig Conference in connection with the hours of observation, &c., and the Society, at its meeting, held on May 21st, decided that a series of questions should be sent out for this purpose; and a report by the "Form" Committee has been presented to the Council as follows:—

REPORT *on the* REPLIES *received in answer to the Questions issued with the Circular of June* 16.

No less than 52 of the Fellows have favoured the Society with their opinions on the various points under discussion; and in addition, communications have been received from Professor Buys Ballot, and from Mr. Plummer, of the Durham Observatory.

In several cases the questions have not been answered directly, more than one answer having been given; in all such instances the author has been taken as adhering simply to the solution for which he expresses his preference.

We shall now proceed to an analysis of the replies; but it must be remembered that in many instances the writers have only answered the questions relating to the subjects with which they were specially familiar, so that a simple comparison of the number of votes would be fallacious.

The replies regarding the best form of barometer were 46, with a very decided opinion in favour of the Kew barometer, 33 recommending it, while the remaining 13 mostly supported the use of Fortin's standard.

On the subject of the utility of aneroids, opinions were more divided: out of 47 votes, 22 were decidedly unfavourable to its use; 19 suggested its employment as an auxiliary instrument, while only 6 were for its general admissibility.

The choice of maximum thermometers was limited to Negretti and Zambra's and Phillips'. It is not easy to give a precise analysis of the views entertained: 32 Fellows wrote in favour of Negretti's and 17 in favour of Phillips'; but several replies suggested that both instruments might be used. 42 answers were received.

As to minimum thermometers, the sense of the Society was nearly unan mously in favour of Rutherford's Spirit Minimum, 40 out of 42 replies takin that line; a few gentlemen, also, recommended the use of Casella's Mercuri Minimum, if sufficient precautions were taken in its management.

For Solar Radiation 25 votes out of 28 were for the black bulb *in vacu* dull black extending 1 inch along the stem. No suggestions of much impor ance were made as to ensuring the comparability of results, but a wish f the adoption of 4 feet above the ground as the height of exposure was e pressed by 12 gentlemen.

On the important subject of hours of observations the unanimity in favo of 9 a.m. and 9 p.m. was very great, 41 out of 50 of the Fellows expressi their approval of those hours. Some few proposed the addition of an 8 a.r observation to work up with the telegraphic reports.

As might be expected, the question of 'local' *versus* 'Greenwich' time elicit a difference of opinion; 48 answers came in, which were divided into 30 f local, and 16 for Greenwich, while 2 made special propositions.

No very decided wish about the division of the year was elicited: gentlemen expressed their opinions, but most of them voted for several class of means.

11 simply wished for the civil divisions of the year to be kept;
22 asked for monthly means;
7 ,, weekly means;
12 ,, 5-day means (mostly Buys Ballot's);
6 ,, seasonal means;

and a few mentioned daily means.

The sense of the Society is rather decidedly against any alteration in length of February; out of 42 answers, 27 being unfavourable and favourable.

The remarks of Messrs. Birt and Bloxam on uniformity in hours of c servation deserve attention. Mr. Forbes gives a good table of corrections the 9 a.m. and 9 p.m. readings for the North of Scotland. Mr. Rundell a also Mr. Plummer make suggestions for artificial divisions of the year.

Professor Buys Ballot has honoured the Society by again putting forwa some of the views which he has already advanced in his valuable 'Suggestio on a Uniform System of Meteorological Observations.'

On the whole, the Form Committee cannot but congratulate the Council having elicited such an extensive expression of opinion on the various poi contained in the Circular.

Appendix to Report.

The remarks of Mr. Birt are as follows:—

"It appears to me that the first element of usefulness in a series of c servations is the object the observer has in view. There are two disti objects which meteorologists may recognise. *First*, climatic relations (hav reference to time only), which must be deduced from observations made

stations where the observers reside; and for such observations the hours of 9 a.m. and 9 p.m. (to the minute) are the most suitable, and these, of course, to be of any value, must be LOCAL mean time. *Second*, the progression of the two principal meteorological elements, temperature and pressure, having reference to space as well as time. If the observer be interested in these progressions, and makes choice of working in concert with the Meteorological Office, his hour of observation is 8 a.m., GREENWICH mean time (also to the minute). A system of three daily intervals of 8 hours each would greatly facilitate the study of the great movements of the atmosphere, the hours of observation being 8 a.m., 4 p.m. and 12 p.m."

Mr. BLOXAM writes as follows:—

"It appears to me that, if the observations of many persons are to be used for the purpose of deducing laws in the science of Meteorology, it is of the greatest importance that 'uniform times of observation' should be adhered to. The system of simultaneous observation is incompatible with uniformity in the ordinary work of Meteorological Observation: and, in my view, the use of local time is indispensable. I believe 12 o'clock, noon, to be the best hour for observing and recording the ordinary meteorological phenomena. I believe this to be the best hour, because the sun's influence upon temperature must, as a rule, be more uniform, as regards diurnal progression, at different stations at this hour than at any other between his rising and setting, and tables for diurnal range will apply more correctly to all stations for this hour than for others. The diurnal progression of temperature is different on an elevated situation from what it is in a valley. This is demonstrated in a printed paper, which I will forward to you.* Of course it is very desirable that the convenience of the observers should be consulted, and if another hour would be more convenient generally, it might be better to select another hour for general use; but 12 o'clock observations would then be very valuable, if made in addition to the other or others."

As announced in the last Report, the Council took advantage of the presence of their Foreign Secretary, Mr. Scott, as one of the delegates from this country to the Meteorological Congress at Vienna, to request him to represent this Society. The Congress was duly held from September 1st to 16th, when Mr. Scott presented the above Report, which was forwarded to him for that purpose, and which has been printed in the Report of the Congress. The PRESIDENT has since received from him the following letter:—

"I have the honour to report to you, in further reply to your letter of July 16, that I have attended the Meteorological Congress at Vienna.

"I duly received the enclosures noticed in your letter, and I formally presented them to the Congress.

"Furthermore, I made it my business to attend the meetings of all the

* *Vide* 'Proceedings of the Meteorological Society,' vol. iii. p. 402.

sub-committees of which I was not myself a member, in order to urge on these committees the views of the Fellows as expressed in the Discussion and in the Replies to the Circular issued by the Council.

"I am glad to say that the opinions contained in the documents referred to carried very considerable weight on more than one point which was in question. And I venture to express the hope, that when the Report of the Proceedings of the Congress is published, it will be found that the resolutions are, on the whole, in accordance with the views of the majority of the Fellows who have expressed opinions on the several questions in the programme."

The Society is greatly indebted to Mr. Scott for the great pains he has taken in this matter.

At the June meeting of this Society a paper was read by Mr. Plummer, of Durham Observatory, which raised the question of the most suitable mounting for thermometers. As it was felt that this was too large a question to be satisfactorily disposed of in the limited time available that evening, the discussion was postponed to the November meeting, when, in order to have a firm basis for discussion and prevent misconceptions or discursiveness, one of our Secretaries, with the assistance of three Fellows of the Society who have given much attention to the subject, submitted a paper specifying the conditions which a good thermometer stand ought to fulfil These conditions, which were all accepted, together with the discussion which took place on them, will be found printed *in extenso* in the January number of the Society's Journal. On the present occasion it is, therefore, only necessary to give a *résumé*, and to point out the important bearing of several of the decisions arrived at.

Condition No. II., which was adopted in the following terms,—"The stand must be so arranged that, even when its own external temperature is raised, the thermometers shall not be thereby materially affected," possibly carries with it the condemnation of all louvre boarded stands in which there are not *two* sets of louvres separated by an interval of a few inches; for when the outer louvres become heated, they may, perhaps, warm the air which passes between them.

Condition III. partly involved the adoption of a closed screen.

Condition IV.—"The temperature of the air alone being required, it is desirable that the thermometers be protected from the communication of other exterior influences," carried with it, as pointed out by Mr. Scott, the condemnation of all open stands,—Lawson's, Glaisher's, James's, Ste. Claire Deville's, Morris's, and Pastorelli's,—and, therefore, naturally gave rise to a longer discussion than any other point.

The same stands also fail to satisfy Conditions VII. and VIII. (no rain or snow should ever reach the dry-bulb thermometers), and the present form of Stevenson's stand must be modified to meet the latter condition, as snow is apt to lodge between the louvres and form a complete wall, thereby preventing free access of air. This would be remedied by making the louvres wider apart.

Condition IX. expressly excludes stands which require turning.

The subsequent Conditions related only to the minor questions of size and cost.

It is difficult to see to which of the conditions objection can be taken. They had all been framed with extreme care, and were merely improved rather than altered by the Fellows present at one of the largest meetings of the Society ever held, and one at which unlimited time was allowed for discussion.

It is with considerable personal regret, on the part of one at least of those who have taken a leading part in the examination of this question, that by condition after condition the use of the Lawson and Glaisher patterns of stand is shown to be an error.

Until of late years they were almost the only stands generally used in this country; and it is within the mark to say that during the last 30 years several million observations have been made from thermometers thus mounted. It is, therefore, desirable to take the earliest opportunity of cautioning observers not to abandon their old stands until they have for several years compared their results with those obtained upon the new pattern which the Council hope will finally result from the elaborate experiments made at Strathfield Turgiss, the report upon which is to be presented to the Royal Society during the present Session.

After this stand is brought out, the Council trust that all "home-made" stands will be abandoned, except where, as above mentioned, comparison is requisite to secure the continuity of past records, and that observers will use tested thermometers and uniform stands, so that comparable results may be obtained.

The Council have had under their serious consideration the very heavy charge for printing the Quarterly Journal; and, having obtained estimates from several firms, have entered into an agreement with Messrs. Williams and Strahan, of Lawrence Lane, Cheapside, to be the printers and publishers of the Society until further notice. They have reason to believe that a very considerable saving will be effected by this arrangement.

The Council have to mark, with some measure of satisfaction, the maintenance of the numbers of the Society during a somewhat critical and transitional period in its history, when changes of detail have been entered upon with a view to increased energy of action, and when the beneficial results of the alterations have not yet had time to be practically felt. During the period that has elapsed since the last General Meeting nine new Fellows have been added to the ranks of the Society, and eleven names have been removed from the list of Fellows—three by death, four by resignation, and four by the Council for non-payment of their annual contributions.

The following is a Tabular Statement of the present numerical strength of the Society:—

	Fellows.			Totals.
	Life.	Ordinary.	Honorary.	
1878, June 18	78	229	7	309
Since elected	+3	+6	...	+9
Since compounded......	+1	—1	...	0
Deceased	...	—3	...	—3
Retired	...	—4	...	—4
Defaulters	...	—4	...	—4
Reinstated	...	+1	...	+1
1878, December 31 ...	77	224	7	308

The Fellows whose loss by death the Society has to deplore are:—

Rev. Canon Chevallier, F.R.A.S., elected into the Society May 7th, 1850.

John Robinson M'Clean, M.P., F.R.S., March 19th, 1862.

James Garth Marshall, M.A., F.G.S., June 18th, 1878.

The Rev. Temple Chevallier, B.D., F.R.A.S., Canon of Durham, was the eldest son of the late Rev. Temple Fiske Chevallier, M.A., Rector of Badingham, Suffolk, and was born October 19th, 1794. He was educated at the Grammar School, Ipswich, and afterwards at Bury St. Edmunds. In 1814 he entered Pembroke College, Cambridge, and at the end of the usual period of residence he graduated as Second Wrangler, and was Second Smith's Prizeman, in 1817. He then migrated to St. Catharine's College, Cambridge, where for several years he was Fellow and Tutor. About the same time he held the college living of St. Andrew the Great, Cambridge, and attained considerable eminence as a preacher; but his greatest success during these early years was his Hulsean Lectures, those on the "Proofs of Divine Power and Wisdom derived from the study of Astronomy" yielding marked indications of his thorough acquaintance with the mathematical developments of the gravitational theory. Mr. Chevallier was an accomplished classical scholar, as well as a mathematician, and was the author of several translations of the earlier fathers. He was equally conversant with the modern as with the dead languages, so that for him the study of philology had always peculiar attractions. For many years he was reader in Hebrew at Durham, and his knowledge of French, German and Italian was exceedingly good. Although making no claim to the honour of being a linguist, these various accomplishments indicate plainly the diversity of his knowledge, and the application and activity which characterised his whole life.

In 1834 he was appointed Professor of Mathematics in the newly founded

University of Durham, and a few years subsequently to the united Professorships of Mathematics and Astronomy, which latter post he held until within two years of his death. Although engaged almost wholly in tutorial duties and clerical work, he devoted much time to astronomical studies, nor did meteorology escape a share of his attention. He was among the very first to make accurate measurements of the height of auroræ with the co-operation of distant observers, and some of his results—obtained, we believe, as early as 1839—have not been surpassed for accuracy. Luminous meteors and the phenomena of lightning were also among the favourite subjects of his researches. In 1848 he endeavoured to investigate the laws of storms from observations taken at various stations in the midland and southern counties, and it only required a wider field and more satisfactory data to have led to valuable results; but his multifarious duties, and the wide range of his acquirements, prevented the development of those useful results which might fairly have been expected from a man of his extensive learning. He at all times took a lively interest in all scientific progress, especially in his own peculiar study, astronomy, and willingly took part in expeditions to observe solar eclipses in 1851 and 1860; and, with the anxiety to impart information which was a prominent feature in his character, he has repeatedly lectured upon this, and a great variety of other subjects. His popular lectures were highly appreciated, and his mode of illustration was remarkably happy.

In 1839 he was mainly instrumental in establishing the Durham Observatory, of which he was afterwards appointed director, and over which he presided for more than thirty years. Besides the active prosecution of astronomical science at this establishment, a full set of meteorological observations has been taken during the whole of this time with great regularity; but it was Mr. Chevallier's care alone that has prevented those interruptions in meteorological work which have so injurious an effect upon the deduced results. His interest in meteorology is shown by his early enrolment among the Fellows of this Society, having been elected May 7th, 1850.

In 1871 Mr. Chevallier suffered from a severe attack of fever, from which he never completely recovered. He relinquished his various appointments in the University, retaining only his Canonry, and lived mostly in retirement. His death occurred somewhat suddenly at Harrow Weald, Middlesex, on November 4th, 1873, at the age of 79 years.

John Robinson M'Clean was born at Belfast in 1818. After receiving a general education he entered the University of Glasgow, where he studied for two years, at the same time pursuing practical studies in Engineering and Surveying. On leaving Glasgow, he entered the office of Messrs. Walker and Burgess, Civil Engineers, where he remained until 1844. During this engagement he was employed in carrying out the Birmingham Canal Improvement Works, and also acted as Resident Engineer on several other important works.

In 1844 he commenced independent practice in London as a Civil

Engineer, and in the same year was appointed Engineer-in-Chief of th Furness Railway and Barrow Harbour. In that capacity he continued unti he entered Parliament in 1868, having planned and executed the great Har bour, Dock and Railway Works which have proved so successful. In th early years of his practice he also constructed the South Staffordshire Rail way, and the Birmingham, Wolverhampton and Dudley Railway, whic passes through Birmingham by a double tunnel. Both in South Staffordshir and Furness Mr. M'Clean was not only the Engineer of the public work with which he was connected, but early took a large view of the resources (those districts, and his great energy and personal influence have been directl conducive to much of their present prosperity.

In 1849, when the agitation respecting the polluted condition of th Thames was at its height, and a Commission was appointed to consider th whole subject, 116 plans were sent in by different engineers; and of these th Commissioners reported that the "best conceived and most practicab "scheme submitted is, in our opinion, that of Mr. J. R. M'Clean. It "characterised by a well-devised system of intercepting sewers, in dete "mining the situation and course of which, a careful and elaborate study ("the levels has been made." Both in this and the previous year, M M'Clean introduced into Parliament a scheme for supplying London wit water (principally by gravitation) from Henley-on-Thames, and, though th Water Companies were successful in their opposition to it, they were short afterwards obliged by Parliament to remove their pumping stations fro London to the river above Teddington Lock, and so far to improve the supp of water to the metropolis.

In 1855 Mr. M'Clean formed one of the International Commission invite by the then Viceroy of Egypt to examine and report upon the works of th Suez Canal. Mr. M'Clean was always largely engaged in general practice as Consulting Engineer, both in England and on the Continent.

In 1861 Mr. M'Clean was appointed one of the Royal Commissioners fo examining and reporting on the numerous plans submitted for embanking th River Thames, and so successful were the labours of the Commission that th Act to which London owes the present Embankment was obtained in th following year. From that time until 1872 Mr. M'Clean acted successivel on the Royal Commissions for the extension of the Embankment of th Thames; on the Royal Commission on the Cattle Plague; on the Royal Com mission on Railways, and on the Royal Sanitary Commission. In 1869 I was elected a Fellow of the Royal Society.

Mr. M'Clean was President of the Institution of Civil Engineers durin the years 1864 and 1865.

In 1868 Mr. M'Clean retired from the active exercise of his profession, ar at the same time entered Parliament as Member for the Eastern Division the County of Staffordshire.

His death occurred on July 13th, 1873, at Stonehouse, near Broadstairs.

He was elected a Fellow of this Society March 19th, 1862.

James Garth Marshall was the third son of John Marshall, and w

born at Leeds, February 20th, 1802. Much of his public life was taken up with politics, and he represented Leeds in the Liberal interest from 1847 to 1852.

His scientific and mechanical knowledge was very considerable: the latter found ample scope in the management of his extensive flax works at Headingley, near his native town; the former is evinced by contributions to geology and other sciences read before the Philosophical and Literary Society of Leeds. He joined the Geological Society in 1833, and was elected into this Society in June last.

Mr. Marshall from an early age took considerable interest in the relative rainfall of different localities. In 1820 he commenced a series of observations at two of the family seats, viz. Headingley, near Leeds, and Hallsteads, on the northern shore of Ullswater Lake, which were continued for many years. His next step was the erection of three gauges at the head of Ullswater, viz. one at Patterdale Hall, a few feet above the level of the lake, and 490 feet above sea level, another on the eastern side of Helvellyn, about 1500 feet above sea level, and a third at about 3100 feet or near the summit. These were observed monthly for a few years, until the upper ones were tampered with and destroyed by tourists. The summit gauge still remains a silent witness that one foolish excursionist is more to be feared than half a century's exposure to the fury of the weather. Meanwhile Mr. Marshall had commenced another set of experiments with three gauges, on a detached hill, a few hundred feet high, near Hallsteads, in order to test the difference of the rainfall as affected by the wind—one being on the summit, one near the foot of the hill on the south-west (the side of the prevalent wind accompanying rain), and one at the foot on the opposite side. The result was the detection of a marked difference in the amount collected.

Mr. Marshall's name appears in the first volume of the British Association Reports as a Life Member, and three papers from his pen were read before the Association; they all refer to geological subjects, the author being an adherent to the metamorphic theory of the origin of granite. He is understood to have prepared an abstract of the results of his experiments on rainfall for presentation to the Association, but to have withheld it because he could not disprove the existence of certain sources of error.

As soon as Mr. Marshall entered upon the Coniston Estates, he established a rain gauge there which has now been observed without the slightest interruption for nearly forty years.

He died at Coniston, October 22nd, 1873, after an illness of only four days.

APPE

Abstract of Receipts and Expendit

Receipts.

Date	Particulars	£	s.	d.	£	s.	d.	£	s.
1873.									
Jan. 1.	Balance from last year				....			61	(
April.	Dividend on £1100 New 3 per Cents. ..				16	4	6		
Oct.	Do. do. do.				16	5	11		
					32	10	5		
Dec. 31.	Subscriptions for 1865..............	1	0	0					
	Do. for 1866........	1	0	0					
	Do. for 1867..............	1	0	0					
	Do. for 1868..............	3	0	0					
	Do. for 1869..............	4	0	0					
	Do. for 1870..............	6	0	0					
	Do. for 1871.......... ..	11	0	0					
	Do. for 1872..............	31	10	0					
	Do. for 1873..............	164	14	0					
	Do. for 1874..............	4	0	0					
	Do. Six Entrance Fees	6	0	0					
		233	4	0					
	Do. Three Compositions £30 0 0								
	Do. Three ditto .. 36 0 0	66	0	0					
					299	4	0		
June 30.	Sales of Publications, Messrs. Taylor and Francis	3	3	11					
	Do. do. Assistant Secretary	0	3	6					
Dec. 31.	Do. do. do.	2	10	3					
	Do. do. Messrs. Taylor and Francis	7	15	6					
					13	13	2		
								345	
								£406	1

Liabilities.

		£	
To Sundry Creditors	....	4	
BALANCE—Excess* of Assets over Liabilities	....	1224	1
		£1228	1

* This excess is exclusive of the Value of the Library and of the Stock of Proceeding

DIX I.

for the Year ending December 31st, 1873.

Expenditure.

1873.	£ s. d.	£ s. d.
Printing Journal, No. 5	11 12 4	
Do. No. 6	29 19 3	
Do. No. 7	35 19 9	
Do. No. 8	19 17 6	
Illustrations in the above	9 4 0	
Authors' Copies	7 11 0	
		114 3 10
Printing Circulars, &c.		17 13 6
„ Registrar General's Reports (Three Quarters)		4 13 0
		136 10 4
Assistant Secretary	100 0 0	
Bankers' Clerks, Christmas	2 2 0	
		102 2 0
Books bound	4 19 3	
Stationery	12 6 9	
		17 6 0
Transmission of Journal	6 15 9	
Postage and Receipt Stamps	11 17 10	
Stamped Cheques	0 2 6	
		18 16 1
Office Expenses, Housekeeper, &c.	31 4 10	
Do. Furniture and Fixtures	1 3 2	
Expenses of Meetings	14 2 0	
		46 10 0
		321 4 5
Balance { Bankers	74 13 4	
Balance { Treasurer	6 16 7	
Balance { Assistant Secretary	3 19 11	
		85 9 10
		£406 14 3

HENRY PERIGAL, *Treasurer.*

Examined with the Vouchers, and found correct, January 17, 1874,

W. R. BIRT, J. S. HARDING, } *Auditors.*

Assets.

By	£ s. d.	£ s. d.
Society's Money invested in New 3 per Cent., £1,100 @ 91¾	1009 5 0	
Subscriptions of the year uncollected	58 0 0	
Do. of former years unpaid	46 0 0	
Furniture, Fittings, &c.	30 0 0	
		1143 5 0
Cash in hands of Messrs. Martin & Co. on 31st December, 1873	74 13 4	
Do. in hands of Treasurer	6 16 7	
Do. in hands of Assistant Secretary, Petty Cash	3 19 11	
		85 9 10
		£1,228 14 10

W. R. BIRT, J. S. HARDING, } *Auditors.*

APPENDIX II.

THE METEOROLOGICAL OFFICE. Robert H. Scott, M.A., F.R.S., Director.— The record of work in the Meteorological Office, in the branch of Oce Meteorology, for the six months, mainly relates to the completion of some of t investigations to which allusion was made in the last report. The entire ser of 2° square charts for the twelve months for Square 3, the Atlantic Doldru has been completed, and is in the press with copious explanatory notes. A simil but less minute, method of investigation, is in process of application to the da for the region adjacent to the single ten-degree square in question, but t materials available for this work will be very scanty in comparison with those which the charts now in the press are based. This fact shows us the great ri of drawing general conclusions as to the meteorology of any large tract of ocea inasmuch as materials are only obtainable for the limited districts which are fre quented by shipping.

The results of the discussion of the data for Sir J. Ross's Antarctic Expeditio have been published. Mr. Meldrum's paper, "Notes on the Form of Cyclones i the Southern Indian Ocean," has been republished for the benefit of seamen.

In the branch of Land Meteorology of the British Isles there are no noveltie in procedure to report, but the Committee have recently adopted a most important resolution, viz. that from the 1st January they will publish quarterly lithographed copies of the individual numerical values for the 24 hourly readings, from each of their seven observatories, for every element which is observed continuously. Only a limited number of copies will be printed, and the subscription for them will be £1 per annum. It is hoped that this step will be approved by those investigators who find the re-measurement of the several values from the plates in the Quarterly Weather Report too heavy a task.

In the branch of Weather Telegraphy, there are two very important advances to be noticed. The first is the intended immediate return to the use of a signal to indicate the direction of the wind in an expected storm, which is announced as *probable*. The signals employed are Admiral FitzRoy's—the cones and drum. The chief differences between the proposed system and the original system established by Admiral FitzRoy are, that the drum does not indicate *dangerous winds from opposite quarters*, is never to be used without a cone, and is employed to emphasize the indication given by the cone. It is also announced that the word *probable* implies that the warnings given by at least *three* out of *five* signals of approaching storms (force upwards of 8 Beaufort scale, a "fresh gale"), and *four* out of *five* signals of approaching strong winds (force upwards of 6 Beaufort scale, a "strong breeze"), will be fully justified. Accordingly, the Office distinctly disclaims the idea of perfect certainty in its warnings.

Secondly, as a result of the Vienna Congress, the Office has undertaken to organise a series of stations which will each give one set of observations daily for the epoch of 0.45 p.m., to be used in preparing a daily chart of weather. The idea emanated from General Myer, Chief Signal Officer, U.S.A., and the plan is international, and is to be carried out over the entire Northern Hemisphere.

ROYAL OBSERVATORY, GREENWICH. Sir G. B Airy, K.C.B., F.R.S., Astronomer Royal.—There are no changes of any importance to be recorded in the Meteorological Department of this Observatory since the date of the last Report.

ROYAL OBSERVATORY, EDINBURGH. Professor C. Piazzi Smyth, F.R.S., Astronomer Royal for Scotland.—The meteorological work here has consisted chiefly in the computation of the bis-diurnal observations at 55 of the stations of the Scottish Meteorological Society, and in comparisons of their chief results with the means of the last 15 years. This work is performed for the Registrar General of Births and Deaths in Scotland, and is printed in his monthly and quarterly returns.

The readings of the rock-thermometers are kept up as usual, and also a small meteorological journal is maintained within the Observatory for the special benefit of the clocks, and other instruments, whose rates or scales are dependent on either atmospheric pressure or temperature.

The season is reported as having been wet and stormy, but a very quiet one touching auroral displays.

RADCLIFFE OBSERVATORY, OXFORD. Rev. R. Main, M.A., F.R.S., Radcliffe Observer.—In the short interval which has elapsed since the last Report of this Observatory, no change worth noting has taken place either in the observers or the instruments.

The reductions of the observations are in a more advanced state than they have usually been, the reduction to numbers of the photographic results, and the taking of the monthly means, being nearly completed for 1871, and some considerable advance having been made in those for 1872.

Very great pains continues to be taken in the reduction of the readings of all the thermometers to the standard, by means of simultaneous readings made usually at 10 a.m. of each day; and it is proposed, by means of a thermometer placed on the south side of the Observatory and at some distance from the building, to determine whether there is any certain difference between the temperature in the shade on the north and south sides.

It is also proposed to place a thermometer on the elevated terrace beneath the tower on its north side, at the height of about 55 feet above the ground, to ascertain how nearly its readings agree with those of the standard thermometer below.

The daily observations of the weather made at 8 a.m., continue to be sent by telegraph to the Government Meteorological Office, and all applications for observations of every sort, whether for practical or scientific purposes, are immediately responded to.

CAMBRIDGE OBSERVATORY. Professor J. C. Adams, M.A., F.R.S.—The meteorological work at the Cambridge Observatory during the past year, consisted of the usual observations at 9 a.m. and 3 p.m., with extra readings at 8 a.m. and 6 p m. for the Meteorological Office, London, which were regularly forwarded every morning.

The observations at 9 a.m and 3 p.m. have been reduced, and a yearly summary is being made out; but for the future these observations are to be discontinued, and only those at 8 a.m. and 6 p.m. reduced.

Observations are to be taken at 0h. 45m. p.m. G.M.T. throughout 1874, and forwarded to the United States of America for discussion.

THE COLLEGE OBSERVATORY, STONYHURST. Rev. S. J. Perry, M.A., F.R.A.S. —During the past year there has been no interruption in the continuous photographic records of meteorological and magnetic changes, and the alterations in the self-recording instruments have not been of any considerable moment.

The windmill governor of Beckley's anemometer being found to work rather stiffly with light winds, a very sensitive supplementary vane has been erected near it, and its direction noted at least once a day on the sheet of the self-registering instrument. The vane also serves to check the anemometer, and when the velocity of the wind is more than four miles an hour the two instruments are found perfectly to agree.

From its first adoption a considerable inconvenience has always been experienced with the Beckley rain-gauge, from the pencil not rising again to the top of the scale after each discharge. Several trials have finally led to the adoption of a supplementary float to assist the rise of the pencil, and this is found to answer satisfactorily.

The Negretti needle mercurial minimum thermometer, after many years of good service, got somewhat sluggish this year, but a visit to the makers has quite restored its former activity.

During the twelvemonth, the measurement of the magnetograms of past years has been continued, and the declination ordinates are now almost completely tabulated. The horizontal and vertical force curves of the last seven years have still to be measured.

A paper has just been published in the Philosophical Transactions on the Magnetic Elements of Belgium obtained with the Stonyhurst instruments and at

the expense of the college authorities. A dip circle and unifilar have beer warded to the Meteorological Observatory at Manilla, and a complete set of recording magnetographs, along with several first-class meteorological in ments, are being sent to the new Meteorological and Magnetic Observatoı Zi-Ka-Wei. The first assistant of this Observatory has lately spent some at Stonyhurst to acquire familiarity with the instruments, and with the mod reducing the observations.

DURHAM OBSERVATORY. John J. Plümmer, Observer.—The meteorolo work at this Observatory has been carried on as usual without interruption dı the past year, and the customary annual summary of results is in coun preparation, and will be printed in abstract in the Annual Report of the Tyn Naturalists' Field Club, and in weekly issues of the local papers.

The whole of the instruments are in good working order; but as sever the thermometers have been in use for many years, it is intended, under the sent of the Warden, to replace them shortly by new ones, and to add radi thermometers to the set. The anemometer was thoroughly repaired in the mencement of the year, and has since acted quite satisfactorily, but it is of n too slender a construction to withstand the gales which occasionally sweep the Observatory.

With the view of rendering the observations more useful, copies of them, the deduced results, have been furnished monthly to the Meteorological O but the hours at which they are made have not been altered to conform t observations which are made under the immediate direction of that O remaining as hitherto, 10 a.m. and 10 p.m.

Some comparisons of temperature results, derived from thermometer different situations, have been communicated to the Society, which it is h may be supplemented shortly by some further investigations of somewhat si character.

The observer having been requested to co-operate in the scheme for ma synchronous observations at numerous stations scattered over the nort hemisphere, additional observations of pressure, temperature, wind, &c., commenced at Durham on January 1st, 1874, which it is hoped may prove u The hour of observation is 0h. 45m. p.m., G.M.T.

MOORSIDE OBSERVATORY, HALIFAX. Louis J. Crossley, F.M.S.— observations of the various instruments are recorded daily at the hours of 10 noon, 2 p.m. and 4 p.m.; and the indications of the maximum and mini thermometers and rain-gauge are noted also.

A self-recording anemograph, thermograph and barograph, and Beckley's registering rain gauge, are in constant use. The barograph and thermograp advantageously placed in a building constructed for them, and furnish dupl tracings by photography. The anemometer is 8 feet above the roof, and feet above the sea level.

Beckley's rain-gauge is compared with a standard rain-gauge by Mr. Glais and thermometers are observed at depths of 6, 12, and 18 inches in the gr A pressure anemometer, working against a combination of springs and forming very delicately and satisfactorily, is placed in the close neighbour of the other anemometer. The time scale is two inches to the hour, and m by the clock in a horizontal position.

The rain-gauge, with a receiver of 25 inches diameter, reads by the lifti a float in a cistern, and so moving a pencil about a cylinder.

The tube of the King's barograph now contains 81 lbs of mercury, and af a range of the pencil of about 6 inches for one inch. The performance is good, and the indications of change are very extended and delicate.

An instrument is in preparation for producing a photographic curve from vacuum solar radiation thermometer.

The instruments are in the charge of Mr. F. Page, formerly one o meteorological assistants at Kew.

BIRMINGHAM AND MIDLAND INSTITUTE. C. J. Woodward, Curator.— chief meteorological instruments at this Institute are, a Standard baromete

Newman, a King's self-recording barograph, and a registering anemograph of the same description as that at the Bidston Observatory. The Standard barometer is read daily at 9 a.m. The barograph sheets are secured and then bound; the anemograph sheets are also bound, but hourly results are entered into a book of the same pattern as that used at Bidston.

VII. *General Remarks on the West Indian Cyclones, particularly those from the 9th to the 21st September,* 1872. By F. H. Jahncke (St. Thomas).

Forwarded to the Society by the Hydrographer of the Admiralty.

[Received December 19, 1873.—Read February 18, 1874.]

The cyclones of the year 1872 presented the most remarkable phenomena; their tracks were of a different form to those usually traversing these parts of the Atlantic ocean; and the course of three of them was almost from S to N. The cause of this was, I think, that the equatorial current had an immense pressure on the trade wind or polar current, owing to the terribly dry weather which prevailed in these Islands, from Trinidad to St. Domingo, up to the month of October, and also the excessive heat which had prevailed in the north during June, July, and August, and the great change in the temperature which must have taken place in the months of September and October, when the temperature there must have gone down considerably, and which must have caused a strong current of the equatorial to the north.

The cyclone which passed over the Caribbean Islands must have had its origin to the south-east of Barbados. It was reported by the Captain of the American steamer from Brazil to St. Thomas and New York, to be to the south-east of the last-named Island. He is always accustomed to find a strong NE trade wind, but had nothing but dead calms. This vessel arrived in St. Thomas on the 18th of September, just after the severe weather. It was strange that it showed itself over the Caribbean Islands in the form of detached gales; but as many details from the Islands are at hand, its progress can be plainly traced, and the centre, when there was any, or the place where the barometer was the lowest. The wind over the Islands was not strong enough to form a sharply defined centre of calm.

The progress was marked by the change of wind which took place at Barbados about 7 a.m. on September 9th, at Martinique about 2 p.m. the same day, at Rozeau, Dominica, about 5 p.m., when the wind shifted suddenly from N to S, it did not arrive at St. Kitt's before the next day (September 10th), at 2 p.m., when the wind changed to W at once, and at the latitude of St. Thomas, about 9 p.m. on September 10th, when the wind was N; it passed this last island about 100 miles to the east. In this part the sea is more free from islands, and here probably it assumed its regular circular form, and went on its northern course. It took ten hours to run from Barbados, which place it passed about twenty or thirty miles to the west, and had a NNW course from

Martinique and Dominica. Its progressive speed was about 16 miles per hour touching Martinique on the east, and Dominica on the west side. The mountains of Martinique and Dominica greatly reduced its progressive speed to just one half when it left the Island of Dominica, from whence it curved on in a NW direction and passed the Islands of St. Kitt's, Nevis and St. Eustatius, about 10 or 15 miles to the west, when it took a more northerly course and passed Sombrero a few miles to the east.

In my former report on cyclones, it is a proved fact that the high land obstructs and retards them in their progressive speed, as well as changing their course, which I have twice observed in the island of Porto Rico, in 1867 and 1871. It is an entirely erroneous idea that these Islands create cyclones; this of the 9th and 10th of September has proved the contrary: viz. that they kept them asunder, and prevented them from forming a whirl. The prevailing winds which blow here on the surface of the sea change from NE to E and SE; a complete revolution is very rare, except in the hurricane season, when a cyclone passes by. Nearly every wind is represented here daily in the higher regions, but cannot be observed, as the state of the weather is not always favourable for it. The west wind is sometimes observed in the highest regions through fine cirrus, almost at such a height in the atmosphere that there is scarcely any formation of clouds; they are only seen for a moment, and the next they have vanished again. From the west wind I conclude that there is a descending current in a revolving way, because this wind is in a very cold region, which will descend on the other. The next wind is the south-west, with its sharply defined cirrus; it shows itself oftener, a proof that it is below the former. Then comes the south wind, which carries along with it full cumulus or cotton-balls; then the south-east wind (see note at end), sometimes with full cumulus and nimbus, and sometimes with light and dark cumulus intermixed. The east wind has the same formation as the south-east wind. The north-east shows itself sometimes with a perfectly clear deep-blue sky, sometimes when there is a heavy pressure from the above southerly winds with cumulus, and nimbus, and also with wet, mist, light fog and drizzling rain, and also with heavy nimbus and a deluge of rain. The equatorial wind must act very powerfully on the trade wind or polar current: as often the wind is south-east with a deep blue sky and very high barometer, also the hygrometer shows great dryness. These instruments, as well as the thermometer, are always unsteady here, their rise and fall are very minute; but we must take into account that St. Thomas is only 18°30′ from the equator, where all instruments show hardly any great movement. All this proves that there is a strong descending current as already described, as the polar current or trade wind is heavy, cold and dry, and flows in a constantly widening bed towards the equator. No wonder that it keeps close to the surface of the sea. Were it not so strongly affected by the south wind, the barometer would stand very high here, and the thermometer would show a much lower temperature in the months of July, August, September and generally half of October, when the trade wind is almost suppressed here on account of the declination of the sun, which warms the polar current before

it reaches this latitude; a cause for its partial suspension. In the hurricane season the atmosphere is, for the most part, clear and serene unless the NE wind spring up and change the sky, when a cyclone passes by at a distance, into white clear cumulus, sometimes also into nimbus, in the space of half-an-hour, and rain begins to pour down in a deluge with thunder and lightning; sometimes the wind will change the pressure of the equatorial into a SE wind and carry the weather along. The rapid descending of the equatorial is caused by the heavy discharge of rain; but when rain is not falling, the wind will take more than 24 hours to change into E and SE, when it calms off. Experience shows that the polar current keeps a cyclone in the Tropics, but the equatorial gives it an inclination to the N, until it reaches the continent of the United States, which will change its course to NE; but it is very capricious; it depends very much on whichever atmospheric current is the most powerful for the season. As is shown in 1872, the equatorial was very powerful, and carried its course with very little alteration to the N. I have also observed that from November to March or April, the trade wind or polar current, which I think is not higher than 2000 feet, is sometimes very powerful, because it flows something like the Gulf Stream, forked out; and sometimes on a fine day with light southerly winds, that the wind is going round to SW, W, NW, N, and NE, in the space of a few hours, and increasing in strength when it comes northerly; sometimes the other way through E and NE. It is clear that we are either on the east or west side of a strong polar current which is proceeding to the south. When the wind reaches to NE, it is generally with nimbus and rain, and a force from 4 to 5; it lasts for more than 24 hours, when it backs again by degrees through E to SE, but sometimes it shows itself only as an E or SE wind, and is very squally, but it takes some time to calm off, when the barometer begins to fall somewhat, and the thermometer rises a little, but very slightly.

I think it would not be out of place to say a few words on white squalls, which happen sometimes, and are terribly destructive to vessels, either capsizing them or carrying away their masts. They occur with fine weather and a good breeze, but I have not heard that they happen on land, but always at sea. It must be a rapid descent of the equatorial wind met below by the trade wind, which arrests its circular motion; that must be the cause, as their duration is only for a few minutes. They happen only from November to March, but sometimes up to June in these parts. Another strange phenomenon was that three of the cyclones of 1872 had a certain spot about 50° longitude and 50° latitude, where their tracks met together.

It is lamentable to think that scientific societies in Europe do not inquire more into the nature of cyclones and their particulars and the motion of the atmosphere in these quarters, where there are millions worth of property at stake every year.

If proper stations on the principal West India Islands were established, with men who feel an interest in the subject, how much would be brought to light for the benefit of commerce and science! These stations should be provided with good marine barometers, and particularly it should be noticed that they

all read alike; and there should be a central station on one of the Islands with a man who is well skilled in these affairs, to control all the observations which should be sent to him to forward the whole to their head-quarters in Europe.

NOTE.—I have to observe on the SE wind and also on the E wind that they are most affected and are very near to the NE wind, which affects them, and changes sometimes the cumulus and nimbus; a proof that they are the next lowest to the polar wind.

Extract from my Meteorological Journal, kept at St. Thomas, from September 7th to 14th, 1872.

General Remarks.

Since noon, September 7th, the barometer showed a slight downward tendency; at that time the wind sprang up from NE, with a force of 3, and kept steady the whole afternoon. Sky very deep blue; sunset very clear and fine.

September 8th. Fine day, deep blue sky: the barometer showed a further downward tendency. I became somewhat uneasy about the coming weather, and took observations that day (see Table). The evening became very blustering, with hard puffs and almost calms alternately; notwithstanding the sun had set clear, but in the afternoon a bank of clouds was to be seen in the south. The tide in the harbour about 3.30 p.m. was rather high.

September 9th. About 8 a.m. I went to the telegraphic office to inquire about the weather in the Windward Islands. I immediately received a reply that all was fair at St. Kitt's and Antigua. About 1 p.m. we received a telegram from Martinique that the weather was very threatening; blowing very hard; every appearance of a hurricane. At 2.30 p.m. I received another telegram from the same place; three ships and a steamer ashore; blowing very hard. Everybody here prepared themselves for the coming weather. Night came on, and the wind had increased in strength (see Table); blustering away the whole night, with some rain showers.

September 10th. The wind kept up the same; but the tide was one foot higher. The whole was of a dismal appearance. The wind shifted from E—E by N—ENE—NE, but the principal one was from E by N. From 4 to 10 p.m. wind hauling gradually round to N, at which point it arrived between 9 and 10 p.m., in which space of time pretty hard puffs were experienced; no damage was done to boats or vessels in the harbour, nor to the town: not much rain fell.

September 11th. At 1 a.m. the wind was WNW, and by daybreak almost W, greatly decreased in force (see Table).

From September 10th, 1 p.m., to September 11th, 1 p.m., the barometer was almost steady, showing a very slight rise and fall only; but after September 11th, 1 p.m., the barometer began to rise. The only strange phenomenon is that the wind took till the 15th September to come back to its old quarters.

Date.	Time.	Barometer corrected.	Attached Thermometer.	Thermometers.			Cloud.		Wind.		Remarks.
				Dry Bulb.	Wet Bulb.	Exposed.	Form.	Amount.	Direction.	Force.	
		In.	°	°	°	°					
Sept. 7	7.0 a.m.	30·056	83·2	82·5	77·0	77·7	Ci. Cu.	2	ESE.	1	A very fine day.
	9.30 ,,	·069	85·7	84·0	77·5	82·9	Ci. Cu. N.	7	SE.	1—2	
	10.0 ,,	·067	85·7	84·5	78·0	83·4	Ci. Cu. N.	5	SE.	2—3	
	1.0 p.m.	30·011	89·2	88·5	78·2	88·8	Cu.	2	NE.	2—3	
	4.30 ,,	29·996	88·2	87·0	75·0	85·9	Cu.	1	ENE.	2—3	
	5.0 ,,	29·998	87·7	87·0	77·5	85·3	Cu. N.	5	ENE.	1—2	
Sept. 8	8.0 a.m.	30·017	85·7	86·0	77·0	84·5	Cu. N.	6	E.	2	
	10.0 ,,	30·022	83·8	—	—	—	Cu.	4	E.	3	
	Noon.	29·985	86·3	86·5	79·0	85·1	Cu.	3	E.	3	
	3.0 p.m.	·960	87·5	88·0	80·0	86·8	Cu.	2	E.	3	
	5.0 ,,	29·963	87·0	87·5	79·5	86·3	Cu.	2	E.	3	
Sept. 9	7.0 a.m.	29·996	84·9	84·0	75·0	82·7	Cu. Ci.	9	E.	3—4	Amount of rain from September 1st to 8th=1·55 inch.
	9.0 ,,	30·013	85·4	85·5	76·0	85·2	Cu. Ci.	9	E.	3—4	
	10.0 ,,	30·014	86·3	86·5	75·5	86·7	Cu. Ci.	9	E.	3—4	
	Noon.	29·987	88·8	87·5	77·5	88·4	Cu. Ci.	8	E.	3—4	
	1.0 p.m.	·966	89·9	89·0	77·0	89·7	Cu. Ci.	8	E.	3—4	
	4.0 ,,	·941	89·2	87·5	77·0	86·7	Cu. Ci. N.	9	E.	3	
	7.0 ,,	·935	86·6	87·0	78·5	—	—	—	—	—	
	8.45 ,,	·947	85·6	—	—	—	—	—	—	—	
Sept. 10	2.30 a.m.	29·899	84·7	85·0	78·0	83·0	—	—	—	—	
	4.45 ,,	·881	83·1	83·5	77·5	—	—	—	—	—	
	5.15 ,,	·876	82·7	83·5	77·0	—	N. Cu.	10	ENE.	6	
	6.0 ,,	·886	82·7	—	—	—	N. Cu.	10	ENE.	6	
	6.15 ,,	·902	82·7	—	—	—	N. Cu.	10	E.	6	
	7.0 ,,	·892	82·5	83·0	77·0	80·0	Cu. N.	10	E.	6	
	9.0 ,,	·908	83·2	84·0	76·5	83·0	Cu. N.	10	E by N.	5	
	11.0 ,,	·872	83·3	84·0	77·0	83·0	Cu. N.	10	E by N.	6	
	Noon.	·845	83·2	84·0	77·0	83·0	N.	10	E by N.	6	
	1.30 p.m.	·828	83·2	84·0	77·0	—	Cu. N.	10	E by N.	5—6	
	2.15 ,,	·809	83·2	84·0	77·0	—	Cu. N.	10	E by N.	5—6	
	2.45 ,,	·788	83·2	84·0	77·0	—	Cu. N.	10	N.	6	

Date.	Time.	Barometer corrected.	Attached Thermometer.	Thermometers. Dry Bulb.	Thermometers. Wet Bulb.	Thermometers. Exposed.	Cloud. Form.	Cloud. Amount.	Wind. Direction.	Wind. Force.	Remarks.
		In.	°	°	°						
Sept. 10	3.35 p.m.	29·774	83·4	83·5	76·5	—	Cu. N.	10	NE.	6	
	4.15 „	·794	83·3	82·5	76·0	—	Cu. N.	10	NE.	6—7	
	5.15 „	·791	83·3	82·5	76·0	—	Cu. N.	10	NE.	6—7	
	6.0 „	·782	83·3	82·5	76·0	—	N.	10	NE.	6—7	
Sept. 11	1.0 a.m.	29·723	83·0	—	—	—	—	—	—	—	
	3.0 „	·785	82·7	83·0	77·0	—	—	—	WNW.	3—5	Sky overcast the whole day; cleared very slowly. Several light showers of rain.
	5.0 „	·829	82·4	83·0	77·0	—	—	—	W.	3—4	
	7.0 „	·858	81·7	80·0	76·0	82·0	Cu. N.	10	W.	3	
	8.0 „	·909	81·7	82·0	76·0	80·2	Cu. N.	10	W.	3	
	10.0 „	·922	83·1	83·0	77·0	81·2	Cu. N.	10	W.	2—3	
	5.0 p.m.	·890	82·4	83·5	77·5	81·2	Cu. N.	10	W.	2	
Sept. 12	7.0 a.m.	29·933	82·8	81·5	77·5	77·7	Ci. Cu.	9	WSW.	1—2	Last night several light showers of rain.
	10.0 „	·967	84·1	84·0	79·0	84·1	Cu. Ci.	7	SW.	1—2	
	1.0 p.m.	·916	88·2	86·5	80·5	87·2	Cu	4	SW.	1—2	
	5.0 „	·908	86·7	86·0	79·5	84·3	Cu. Ci.	6	SW.	1—2	
Sept. 13	7.0 a.m.	29·975	84·2	83·5	79·0	79·9	Ci. Cu.	7	SW.	1—2	
	9.30 „	30·011	87·3	86·5	79·0	86·7	Cu. Ci.	7	SSW.	2	
	10.0 „	30·010	87·5	86·5	79·0	86·8	Cu. Ci.	7	SSW.	2	
	1.0 p.m.	29·970	88·9	87·0	79·0	87·8	Cu. Ci.	7	SSW.	2	
	5.0 „	29·950	87·2	86·5	79·0	86·2	Cu. Ci. N.	8	SSW.	2	
Sept. 14	7.0 a.m.	30·022	85·2	84·0	79·0	81·2	Cu.	2	SW.	2	Clear deep blue sky; distant objects sharply defined the whole day.
	9.30 „	·058	86·9	86·0	80·0	85·1	Cu.	3	SW.	2	
	10.0 „	·061	86·9	86·0	80·0	85·2	Cu.	3	SW.	2	
	1.0 p.m.	·020	88·7	87·5	80·5	88·1	Cu.	4	SSW.	2	
	5.0 „	·004	88·2	86·5	80·0	87·3	Cu.	3	SSW.	2	
Sept. 16	7.0 a.m.	30·072	85·4	84·5	78·0	81·3	Cu.	3	SE.	2	At 8 p.m. the moon had a very large halo

DISCUSSION.

Captain Toynbee said that the paper was a practical illustration of the use of the telegraph in foretelling cyclones, for Mr. Jahncke was able to learn the hour when this cyclone passed the various islands to the south of St. Thomas, which gave him ample time for warning the ships at anchor there. He added that Mr. Jahncke, who was evidently a careful observer, made some very interesting remarks on the motion of the various strata of clouds, and stated that he (Mr. Jahncke) believed cyclones to be caused by a collision between the upper south-westerly and lower north-easterly currents of air, their tracks being governed by the relative strengths of these currents. Captain Toynbee thought that such opinions, from so careful an observer, so well placed, demanded full consideration. They (viewed in connection with the different opinions of others) proved how necessary it is that more attention should be paid to the study of cyclones, and were a strong argument in favour of Mr. Jahncke's desire to establish a regular system for observing meteorological data over the whole of the West India Islands.

Mr. Scott said that the author had studied storms for several years while he had been resident at St. Thomas, and had published annual reports similar to the present in German papers such as the "Hansa." The present paper was entitled, "General Remarks on the West Indian Cyclones, particularly those from the 9th to the 21st of September, 1872," but it only contained a detailed account of one. In the paper by the same author in the "Hydrographische Mittheilungen Berlin," other storms of 1872 were noticed, and it seemed that Herr Jahncke had translated only part of his paper into English. As to his explanation of the possible cause of cyclones, it seemed to resemble that proposed by Dove, who considered that they were due to the intrusion of air from the upper return trade into the true trade wind below it. One of the cyclones given on the chart had been far to the eastward in 35° W, and had crossed the Sargasso Sea.

Dr. Tripe observed that on hearing the remark in the author's paper that the course of the cyclone is not affected by the Island, he had referred to the chart accompanying the paper, on which the tracks are laid down, and quite agreed with the author in his remark.

Mr. Eaton remarked that white squalls and hurricanes had possibly a common origin—a ripple produced by the upper return current in the surface trade or monsoon. It was stated in the paper that white squalls generally occurred in the winter and spring, and that hurricanes were most frequent in the autumn. Now the latter prevailed when the atmosphere was highly charged with vapour, the former when the air was comparatively dry. In the autumnal months there would be great condensation, leading to a general disturbance, which under favourable conditions would result in a hurricane ; but in the winter and spring there would be little or no condensation, and the perturbation would expend itself locally, and soon disappear.

Mr. Strachan said the writer had merely placed before them certain conclusions and speculations unsupported by facts. Without data his statements were of very little value. He must say that if he were asked what were the best achievements of meteorology, he would reply that the first and foremost were the laws of storms. These laws had been developed in the elaborate works of Capper, Redfield, Reid, Piddington, Espy, Dove and many others, well and succinctly digested in Birt's Hurricane Guide, Becher's Storm Compass. All these works were text books. These investigators had brought forward abundant data to support their theories, which moreover stood the test of being reasoned upon by statical and dynamical principles. For the last forty or fifty years navigators had been guided, and navigation benefited, by these laws of storms. They had long formed an important subject of instruction in our nautical schools, and in this way had employed the minds of a large number of thoughtful teachers, who were satisfied that they were conformable to facts and principles. It was too much to expect that, without adequate reason assigned and proof given, they were now to be ignored or even doubted. Neither the assertions of Mr. Jahncke, nor the spiral theory of Mr. Meldrum, could be explained on mechanical principles, while the data was insufficient to warrant their acceptance. Writers who base their theories of storms on upper currents of air, or the won-

derful notion of indefinite spirally incurvating winds, were not worthy of se attention, unless they came with overwhelming proof. By all means let the of storms be further investigated, with modern accuracy of method, of obse tion, and of instruments, with as much data as can be collected; but let no conceived and crude theories upset well-established laws, which if not rigoro true, were true in the main, and can never be satisfactorily elucidated by efforts and spasmodic speculations.

CAPTAIN TOYNBEE remarked, with reference to white squalls, that he been struck by the frequency of squalls from the direction of the counter u currents of air in parts of the sea where the lower wind was from nearl opposite direction. He was more especially alluding to the observation square 3, which are now being discussed in the Meteorological Office. Th for instance, he found that at the northern verge of the SE trade, the u clouds very frequently moved from NE, and squalls would come from though the steady lower wind was always south-easterly or southerly, as if upper current of air sometimes forced its way downwards through the lo current, causing the squall, and then rose again.

With regard to Mr. Strachan's remark that the circular theory of cycl was sufficiently well established, Captain Toynbee said that there did not s to be any doubt as to the fact that winds from all points of the compass blowing in each cyclone; but Mr. Meldrum's researches seemed to show some of these winds blow directly towards the centre, which would mak necessary to change the rules for the management of ships experiencing th The uncertainty on this point is the chief reason why a more careful inq should be made into the action of air in cyclones.

Mr. LAUGHTON said that in the paper which had just been read, there was point of great interest, namely, the attempt to connect the cyclones of the W Indies with detached gales and broken weather previously observed to the so east of Barbados. Our utter ignorance of the way in which cyclones origi had often been remarked; and if it could be established that they commen such a manner,—a number of gales, apparently isolated, coalescing into gigantic whirl,—a knowledge of the fact would be a great step in advance. would be most desirable to have further information concerning this: and calling special attention to it might possibly lead to continued and exact ob vation in this direction.

Mr. SYMONS quite agreed with the remarks of Mr. Laughton. He would say that the paper proves the author to be a very careful observer. What required was the development of a system of observations in the West In He used the word development rather than creation or organisation, in re nition of the zealous manner in which Governor Rawson was working up meteorology of Barbados; in which respect he was certainly setting su precedent as no other Governor had ever done. It seemed that Mr. Jahnc object was to carry this out. Could the Society do anything to assist hi this important work? He would suggest that when the paper is printed extra number of copies should be struck off for Mr. Jahncke's use; but of course would be a matter for the decision of the Council.

Mr. SCOTT said, in answer to Mr. Laughton, that the origin of cyclones been dealt with by Mr. Meldrum in a paper read before the Society in 1 His view was that they were generated between two currents of air, which creased in force as separate gales until at last a cyclone was formed.

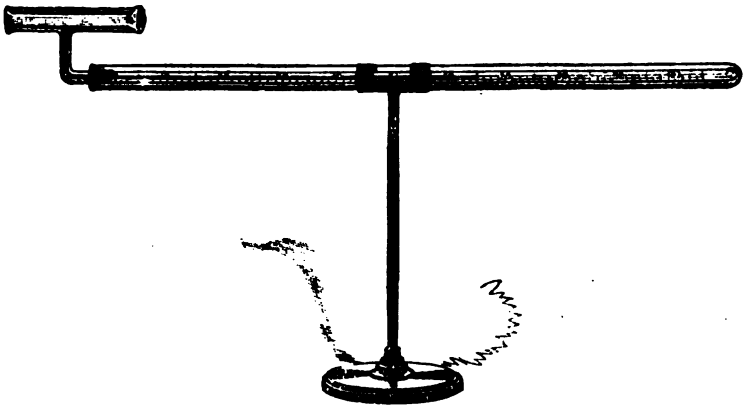
Mr. STRACHAN thought that there was no occasion to print off extra co of this paper, as had been suggested by Mr. Symons, for he had read much same statements by the same author in a recent number of the "Revue Mari et Coloniale," a translation from the pages of the Hamburg Journal, "Han therefore the paper appeared to have had quite sufficient publicity.

VIII. *New Forms of Alcohol Thermometers.* By J. J. HICKS, F.M.S

[Received January 19th.—Read February 18th.]

THE Alcohol or Spirit Thermometer, as ordinarily constructed wit globular bulb, is sluggish in responding to sudden changes of temperat

compared with the mercurial thermometer. For this, among other reasons, general preference is given to the mercurial, although for some purposes, the spirit cannot be dispensed with. For very low temperatures it is indispensable; and, though various attempts have been made to produce a mercurial thermometer for registering the lowest temperature during a given interval of time, Rutherford's spirit minimum thermometer is still practically the most useful instrument for this purpose.



In order to render accordant the changes of temperature exhibited by mercurial and spirit thermometers, when placed side by side, especially when the variations are sudden, I have modified the construction of the bulb of the latter thermometer so as to reduce its cubical contents, and to present as large a surface as possible to the influence of the medium, the temperature of which it is required to indicate: I make the bulb either what I term "Bottle" shape or "Cylinder-Jacket" shape.

The bottle-shape bulb is cylindrical, with the bottom pushed in as much as possible; an exaggerated imitation of some wine bottles. The air, or other fluid medium, in which it may be exposed, acting upon the hollow as well as the outside surface, and the stratum of spirit between the glass surfaces being thin, the thermometer is found to be very sensitive.

In order to determine the relative sensitiveness of this form of bulb over the ordinary spherical bulb, some experiments were kindly made by Messrs. Whipple and Baker at the Kew Observatory. They show that the time which a "bottle-bulb" thermometer required to fall through 25° was 55 seconds, whilst a spherical bulb took 145 seconds to fall through the same extent of scale. In rising through the same divisions, the spirit in the one bulb occupied 57 seconds against 144 seconds for the other, which is practically the same as for the fall.

There is thus shown to be a a great gain in sensitiveness by this form of bulb. But I was scarcely satisfied with the result, and have since effected a further improvement. In this I have given to the bulb the "cylinder-jacket" form. The bulb consists of a long cylinder of glass, hollow, and about which a second cylinder is blown and united at the open ends, so as to leave a thin

space between them to contain the spirit. To compare small thing great, the arrangement of this bulb is similar to the jacket of a cylinder.

The stem of the thermometer is connected to a middle point in th cylinder. In this form of bulb there is large internal and external sur act upon, with small cubic contents, consequently the thermometer tremely sensitive, far surpassing in this respect the "bottle bulb." T the exact figures obtained by Messrs. Whipple and Baker is perhaps t confirmation of this assertion.

They are as follows, being means of two sets of readings:—

RISING READINGS.

Range. 53° to 81°	Kew Standard Mercurial	Cylinder Bulb	Bottle Bulb	Spherical Bulb
	seconds	seconds	seconds	seconds
28°	24	26	80	185

FALLING READINGS.

81° to 53°				
28°	31	42	87	187

Mr. Whipple says, "Undoubtedly the falling readings take longer to att "the rising, but really the difference is trifling. Our method of experi "has been to take two verification jars side by side, one with water at "other at 81°, knowing the temperature by independent thermometers. "with all the experimental thermometers fixed on the same frame, "them out of one jar into the other, and take time at which they acq "new temperature. Our mercurial standard is a cylindrical bulb ¼ "diameter and ¾ inch in length; and the cylindrical spirit bulb is jus "equally sensitive."

I may add, that in 1862 Mr. Beckley suggested forming thermomet on the pattern of certain bottles, in which the bottom is forced up a l into the body; and I constructed a mercurial thermometer of this form was shown in the International Exhibition. Practical difficulties at th however, prevented the manufacture of this kind of thermometer, a one or two were made.

DISCUSSION.

Mr. PASTORELLI said he did not think the new T form of thermome the best, as it would be affected by the pressure of the atmospher spherical bulb we always get an error, although small. The new instru far as he could judge by its appearance, the extension of surface was as of that of a spherical bulb; the error from this cause would be greatly mu it could be readily calculated. He did not think the fluid test sufficien late Mr. Welsh gave a table of Pressures on spherical bulbs, and the erro were from 0°·3 to 0°25, according to the thickness of the glass; he had t periments and found like results; he considered sensitiveness and accura inseparable.

Mr. HICKS said that he had considered the question of the effect of the atmospheric pressure upon the bulb. He had made several experiments, submitted it to a pressure of 50 lbs. on the square inch, and the effect v

trifling; so that he could say the error caused by the changes of atmospheric pressure was really nothing. The utmost variation from the ordinary changes of pressure would not exceed one hundredth part of a degree.

Mr. STRACHAN thought that as meteorological changes of temperature did not often happen so suddenly as to occupy only a few minutes, meteorologists did not want such specially sensitive thermometers; but if for particular purposes they preferred them to ordinary ones, they had them perfectly satisfactory as made by Mr. Hicks, the Kew experiments showing that they were equal to if not more sensitive than the mercurial standard.

Mr. FIELD did not agree with Mr. Strachan: we do want very sensitive thermometers. For instance, in the evaporation experiments, which were being carried on at Strathfield Turgiss, very sensitive thermometers were required to ascertain the temperature in a number of different vessels as nearly simultaneously as possible with the same thermometer.

Dr. TRIPE was of opinion that this thermometer would be very useful where sensitive thermometers are required. Indeed, for a long time past, chemists have ceased to use thermometers with spherical bulbs, as they are too slow in their action for analytical and other similar purposes. He had used a pear-shaped bulb for many years, and considered, from his experience, that if thermometers for meteorological purposes are required to be sensitive as well as accurate, that the spherical shaped bulb should not be used for new instruments.

Mr. SCOTT thought it was comparatively easy to get mercurial thermometers sensitive enough; the bulbs must always be cylindrical. Great credit was due to Mr. Hicks for this improvement in the construction of spirit thermometers, which rendered them sensitive also. His only fear was that the instrument would be fragile.

Mr. DINES was quite sure that even the mercurial thermometer was not sensitive enough. On windy days, while making experiments with his hygrometer, he had often watched the wet bulb, but it was not quick enough to follow the changes which took place in the amount of vapour in the atmosphere.

Mr. SYMONS was of opinion that we do want very sensitive thermometers, especially for terrestrial radiation purposes. For instance, when there is a cloudy sky at night, there might come a gap in the clouds, the temperature would suddenly fall very rapidly, and we should not be able to get the extreme cold by the ordinary thermometers, as they would not fall fast enough, and before they reached the true temperature, the gap might have closed, and the temperature have begun to rise again. Mr. Hicks's thermometer would have a much better chance, for he believed that this and the bifurcated thermometer are equal to spherical mercurial ones 0·4 inch in diameter. The only thing that could be said against it was its liability to breakage, but he had not had any accident with his.

Mr. WHIPPLE said that with reference to Mr. Pastorelli's remarks about barometric variations, the effect upon this instrument was very trifling. It is not easy in every instrument to give a correct verification, on account of its inability to follow the changes the mercurial standard, with which it is compared, undergoes sufficiently quickly; but in the case of the present instrument this cause does not prevent an accurate verification. He was of opinion that for sudden atmospheric changes we do require a sensitive thermometer, especially in squalls. He agreed that it was brittle; but since it does not require any violent manipulation, as in the case of maximum thermometers, this quality is not a serious objection to its employment.

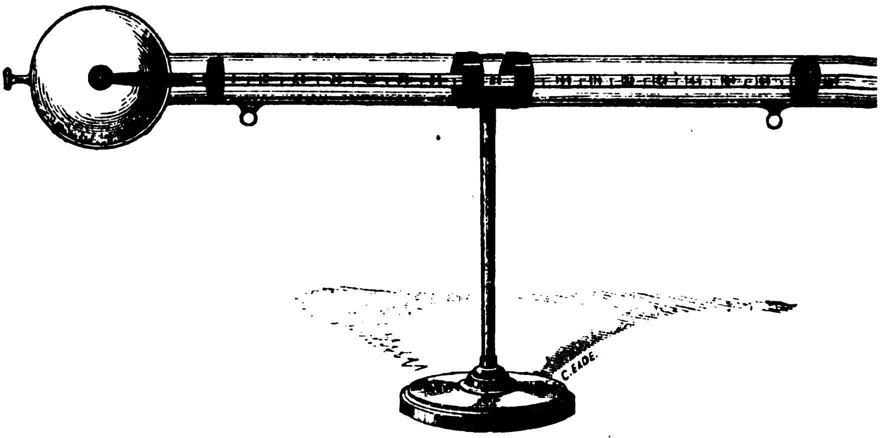
IX. *An Improved Vacuum Solar Radiation Thermometer.* By J. J. HICKS, F.M.S.

[Received January 21st.—Read February 18th.]

HITHERTO the great difficulty, if not impossibility, of obtaining Solar Radiation Thermometers which are strictly intercomparable for the same circum-

stances, as regards time and place of exposure to sunshine, has been a source of much perplexity to meteorologists.

When Sir J. Herschel suggested the introduction of the black-bulb thermometer into a vacuum chamber, made of glass, he certainly did not foresee the extent of uncertainty which has undoubtedly been the detrimental characteristic of such instruments. Not only has it been found necessary to



supersede the bright black bulb by a dull black one, but Mr. Stow has shown the advisability of dull blacking also the neck of the thermometer stem. Moreover, it is to him that the chief credit is due, for the endeavour to organise a systematic comparison of these instruments with an assumed standard. There cannot be a doubt but that an appreciable difference in the size of the bulbs causes considerable difference of indication. It is equally certain that a much more important matter is the perfection of the vacuum. As regards this particular, hitherto no certain means of test has been made available for the purpose of ascertaining the amount of air or gas which has been left in the chamber. Some makers, indeed, affirm that in the instrument, as made by them, the air is reduced to 1-120th part of an atmosphere, or say, 0·25 of an inch of mercury in pressure. However, it is more than probable that the largest number of these instruments that have hitherto been made, have never had a vacuum anything like so perfect; and from experiments which I have lately made on a large number of instruments, and in a variety of ways, I am led to conclude that the vacuum ought to be true to within one-tenth of an inch of pressure, and that it can be brought within one-fiftieth of an inch without resorting to the Torricellian vacuum, which, except for the presence of mercurial vapour, may be regarded as perfect. It is believed that in perfect vacua these instruments will prove strictly comparable. But it is necessary that the meteorologist should be able at any time to satisfy himself of the goodness of the vacuum.

It occurred to me that the true test for the vacuum would be the passage of an electric current from a Ruhmkorff's coil through the chamber. In Noad's Electricity, 4th edition, page 742, it is stated that "In the Torricel-

lian vacuum, the inductive spark is white, filling the whole tube," and J. P. Gassiot, F.R.S., has abundantly proved that in Torricellian vacua the discharge of an electric current from a Ruhmkorff's coil, by connecting platinum wires in the glass tube with the terminals of that apparatus, the cylinder is brilliantly illuminated with a dense white phosphorescent light, filling the whole of the vacuum, while traces of stratification and transverse bands can be detected. He found, however, that a small globule of mercury present on one occasion interfered with the effect. He moreover found that the vacuum must be perfect or within one-tenth of an inch of pressure, and that the slightest trace of moisture must be avoided. Accordingly I have now succeeded in applying these discoveries of Mr. Gassiot to the practical purpose of testing the vacua in which it has now for many years been the practice to place solar radiation thermometers. To do this, I insert two platinum wires, one near each end of the glass chamber, in all instruments which I now make. The astonishing result, I find to be, is that a vacuum heretofore deemed sufficiently perfect by the best and most careful makers will not pass the test. I have, however, at length succeeded in making them, so that any number, when tested, exhibit the same results as nearly as possible. Tried by connecting a syphon pressure gauge, as suggested to me by Mr. R. Strachan, the vacua I get are always within one-twentieth of an inch, but in most cases within one-fiftieth of an inch. Any pressure exceeding one-tenth of an inch will not give the test indications, while the presence of aqueous vapour is shown by a redness in the light. It is necessary that the interior of the chamber should be thoroughly clean and dry; with these conditions and the proper limits of pressure, the test conditions are always similar, namely; a pale white phosphorescent light with faint stratification and appearance of transverse bands. Having experimented largely on all known ways of producing a vacuum, I am now in a position to produce these instruments with better vacua than hitherto beyond all comparison, and under conditions that admit of strictly similar electrical tests.

DISCUSSION.

Mr. Strachan said they had placed before them a happy practical application of a scientific discovery which had hitherto been rather a subject of wonder and delight than of utility. It was amazing indeed that the application had not been made before. Having been at some pains to enlighten himself by reading Mr. Gassiot's Bakerian Lecture "On the Stratification of the Electric Light," delivered to the Royal Society in 1858, he would with their permission give a short *résumé*, and read a few quotations which he had noted down. It was well that the President had invited them to inspect the instruments and the phenomena of the electric test at the table after the meeting, for there was more than the mere colour of the light, which alone was distinguishable at a distance. There were the so-called stratifications or transverse bands, to see which one must be close to the instrument. Up to the time of Mr. Gassiot's experiments the electric light seen in Torricellian vacua was without stratifications; not the slightest trace of transverse bands had been detected. Experimentalists had discovered the striæ or band-discharge by introducing in a very attenuated state vapour of naphtha, phosphorus, sulphuric ether or other volatile substance. The vapour so used was too infinitesimal in amount sensibly to impair the vacuum, still it gave this marked result. Mr. Gassiot repeated these experiments, and going further, he discovered that the phenomena

could be equally well produced if two conditions were secured: first, the vacuum must be as perfect as pump can make it; second, all trace of moisture must be carefully absorbed. May it, then, not be that with an ordinary vacuum the naphtha or other vapour is effective because it neutralises the slight trace moisture present? Gassiot improved the vacua by boiling the mercury in the tubes, and then obtained "distinct stratifications;" and he adds, "In no two tubes could I obtain precisely the same result: in some, the stratification was more or less distinct, in others scarcely visible, but in all a residuum of air, more or less, could be detected." In one tube, in which moisture could be detected, the discharge was in a wavy line without any stratification. He subsequently obtained better vacua by Welsh's process of filling the tubes with mercury, and the transerve bands were well defined and distinct. He emphatically remarks that the glass tubes must be equally well cleaned and well deprived of moisture. Since Dr. Tyndall's researches on the powerful action of aqueous vapour on radiant heat, I have always believed that the anomalous results obtained from solar thermometers in vacuo were due, if not entirely, in a great measure to the presence of aqueous vapour in not a few of the instruments used. It is therefore satisfactory to know that the electric test reveals this moisture; for an instrument in which there is the slightest trace of moisture cannot possibly exhibit the transverse bands unless naphtha or other vapour has been purposely introduced to bring about the desired result. Mr. Gassiot terms the discharge from entering wires *direct*, and points out that an *induced* discharge may be obtained from outside metallic coatings. A powerful magnet causes the tranverse bands to rotate, but the action is reverse for the induced discharge. These are highly interesting phenomena, and appear to be infallible guides to meteorologists in testing their solar thermometers. It appeared to him, however, that a definite power of coil and battery should be used, for the effects were intensified by larger batteries and larger coils. It was this view of the matter which rendered it desirable to have such instruments tested by a recognised and impartial authority, and the functions of the Kew Observatory seemed to point it out as the most suitable place for verification; but an arrangement would have to be come to with Mr. Hicks.

Mr. Scott said that while admiring this very beautiful arrangement for testing the vacuum by the electric light, it should be mentioned that, as far as he knew, the first idea of testing the degree of rarefaction attained had been proposed by Messrs. Negretti and Zambra, who had introduced a small mercurial gauge into their instruments. The present method seemed to him to be a great step in advance.

Mr. Lecky said that he remembered the Bakerian Lecture, which had been referred to, quite well. Mr. Gassiot used a tube about 4 feet long, and obtained a bright white light and with decided stratification. Professor Faraday, who was present, spoke about the stratification, saying that he thought this might be accounted for by the residuum of gas which was sure to exist even after the most perfect vacuum which it was in our power to produce.

The President remarked that there could be no question as to the value and extreme interest of this method of measuring the degree of exhaustion, and testing the residuum of watery vapour, or other gaseous substance, present in the approximate vacuous space. The most exact results would probably be secured by having standard and known comparisons for the light. He drew attention to the remarkable fact that in some of Geissler's very beautiful vacua tubes, results in the matter of tint, light, and form of luminosity had been attained which could not be physically accounted for. This cause of uncertainty, however, would not apply in the case of the exhausted jackets in this process, where only water vapour and very rare air would be present within the interior spaces giving manifestation of the electric light.

Mr. Hicks said, in reply to Mr. Strachan, that although he had made hundreds of tubes with Torricellian vacua, he never knew one to fail showing stratification and white light when the tube was thoroughly clean and free from moisture.

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

JANUARY 21st, 1874.

Annual General Meeting.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

Mr. BIRT and Mr. GLYDE were appointed scrutineers of the ballot for Officers and Council.

Mr. SYMONS read the Report of the Council and the Financial Statement. (p 74.)

It was proposed by Mr. LECKY, seconded by Rev. S. J. PERRY, and resolved:—"That the Report just read be received and adopted, and circulated among the Fellows of the Society."

Mr. BREWIN proposed "that in future the Balloting List for the Officers and Council, prepared by the Council for the Annual Meeting, comprise the names of as many Fellows only as have to be elected, and that the words '*proposed by the Council*' be printed at the head of such list;" this was seconded by Mr. WALKER, but after some discussion it was withdrawn, and the following resolution was then proposed by Mr. BREWIN, seconded by Dr. TRIPE, and carried:—"That in future the Balloting List for the Officers and Council, prepared by the Council for the Annual Meeting, comprise the names of as many Fellows only as have to be elected, unless the names of other Fellows shall have been previously proposed in writing by three Fellows, in which case the said names shall be added to the List."

The PRESIDENT then delivered his address. (p. 59.)

It was proposed by Mr. HARDING, seconded by Dr. MERRIFIELD, and resolved:—"That the thanks of the Society be given to the President for his Address, and that he be requested to allow it to be printed."

It was proposed by Mr. SCOTT, seconded by Mr. DINES, and resolved:—"That the cordial and best thanks of the Meteorological Society be communicated to the Council of the Institution of Civil Engineers for having granted the Society free permission to hold their meetings in the rooms of the Institution."

It was proposed by Dr. TRIPE, seconded by Mr. SYMONS, and resolved:—"That the best thanks of the Society be given to the President for the ability and courtesy displayed by him in the chair."

It was proposed by Mr. STRACHAN, seconded by Mr. BRUMHAM, and resolved:—"That the thanks of the Society be given to the Officers, and other Members of the Council, and to the Auditors for their services during the year."

It was proposed by Mr. PASTORELLI, seconded by Mr. TABOR, and resolved:—"That the thanks of the Society be given to the Standing Committees, and that they be requested to continue to discharge their duties until the next Council Meeting."

The PRESIDENT then announced the result of the ballot, and declared the following gentlemen to be the Officers and Council for the ensuing year:—

PRESIDENT.—Robert James Mann, M.D., F.R.A.S.

VICE-PRESIDENTS.—Charles Brooke, M.A., F.R.S., F.R.C.S.; George Dines; Henry Storks Eaton, M.A.; Lieut.-Col. Alexander Strange, F.R.S.

TREASURER.—Henry Perigal, F.R.A.S.

TRUSTEES.—Sir Antonio Brady, F.G.S.; Stephen William Silver, F.R.G.S.

SECRETARIES.—George James Symons; John W. Tripe, M.D.

FOREIGN SECRETARY.—Robert H. Scott, M.A., F.R.S., F.G.S.

COUNCIL.—Percy Bicknell; Arthur Brewin, F.R.A.S.; Charles O. F. Cator, M.A.; Rogers Field, B.A., Assoc. Inst. C.E.; Frederic Gaster; John Knox Laughton, M.A., F.R.A.S.; Robert J. Lecky, F.R.A.S.; William Carpenter Nash; Rev. Stephen J. Perry, M.A., F.R.A.S.; Capt. Henry Toynbee, F.R.A.S.; Charles Vincent Walker, F.R.S.; E. O. Wildman Whitehouse, F.R.A.S., Assoc. Inst. C.E.

The Meeting then terminated.

FEBRUARY 18TH, 1874.

Ordinary Meeting.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the chair.

ARTHUR ROBERT ANDERSSON, Walton-on-the-Hill, Liverpool;
WILLIAM B. BRYAN, Burnley;
SAMUEL GEORGE DENTON, 34 Foreign Street, Brixton, S.W.; and
CHARLES HARDING, 187 Ebury Street, S.W.,
were balloted for and duly elected Fellows of the Society.

The names of six Candidates for Admission into the Society were read.

Mr. N. ST. B. BEARDMORE and Mr. JAMES DEANE were admitted Fellows of the Society.

The following papers were then read :—

"General Remarks on the West Indian Cyclones, particularly those from the 9th to the 21st September, 1872." By F. H. Jahncke. (p. 89.)

"New Forms of Alcohol Thermometers." By James J. Hicks, F.M.S. (p. 96.)

"An Improved Vacuum Solar Radiation Thermometer." By James J. Hicks, F.M.S. (p. 99.)

"Note on a Waterspout which burst on the Mountain of Ben Resipol, in Argyleshire, in August, 1873." By Robert H. Scott, M.A., F.R.S. [Received January 21st.—Read February 18th, 1874.]

Extract from Letter of Sir T. M. Riddell, Bart., of Strontian.

"We were fishing on Loch Sunart in the afternoon, and we saw it looking very black to the west, and hurried home, thinking a storm was coming on; but there was very little on our side, in fact only a slight shower. The storm cloud turned towards Ben Resipol. I do not think there was any thunder that day. The waterspout, or whatever it was, burst on the very summit of the hill, as part of the water came down by Resipol farm, and flowed into Loch Sunart, choking up the bridge, overflowing the fields opposite the farmhouse, and destroying some wire fences and crops. The chief flood, however, was into Loch Shiel; it came down in two streams, close by a shepherd's house, which it might have carried away, but a big rock, weighing many tons, was brought down by the flood and deposited in front of the cottage, which it probably saved by breaking the force of the water, which then ran into the stream between Lochs Dulate and Shiel. The rest of the flood came down about a mile to the west of this, and ran into Loch Shiel itself; it carried away or destroyed about 500 or 600 yards of wire fencing, about 150 yards of which it completely covered up by the stones and rubbish brought down. A stag had been killed on the hill in the forenoon by one of my shooting tenants and left till a pony could be sent for it —this was brought down the hill by the flood, and left on the Loch side. It is supposed that a good many sheep were buried, but this cannot be ascertained. The noise of the rush of stones, &c., was heard at a considerable distance."

Mr. SCOTT stated that he had first heard of the occurrence in the month of December, and that all his subsequent inquiries had failed to elicit the precise day on which the waterspout took place. It had been during the first fortnight of the month.

Mr. BUDD asked whether or not waterspouts were observed except at sea?

Mr. SYMONS said that Ben Resipol was close to the sea; but that distance from the sea was not material was proved by what occurred at Todmorden, in South-west Yorkshire, 50 miles inland, on July 9th, 1870, where there was just such a deluge of rain on a bleak moorside (*estimated* at nine inches, from the ascertained fact that one road 34 feet wide was 4 feet 6 inches deep in fast running

water for two hours, and from the known limit of the watershed whence alone some 13 million cubic feet of water must have come). There was, however, another difference between the two cases; for while in Argyleshire there seems to have been no loss of life and little harm to property, in the Yorkshire case many lives were lost, and the mills, houses, and bridges in the valleys left a perfect wreck.

CAPTAIN TOYNBEE asked if the water ever rose in a waterspout?

Mr. SCOTT said that a good instance of water rising was given by Professor Reye, in his work on "Wirbelstürme," in which he cited a whirlwind which occurred at the Siebengebirge, near Bonn. Its track crossed the Rhine, and as it crossed, the water rose to meet the tube from the clouds.

Mr. SYMONS could quote a striking illustration of water rising (which was, moreover, another case of an inland waterspout). In November, 1873, two "pipe-like" objects were seen near Banbury, when one of these passed over a pond, nearly all the water in that pond was drawn up into the air and the pond left empty. The water rose up at least 60 feet, was carried horizontally about 200 yards, and then dropped.

The Meeting was then adjourned.

Donations received from January 1st to March 31st, 1874.

Presented by Societies, Institutions, &c.

Algiers	Observatoire National	Panorama Météorologique du Climat d'Alger, 1872, Janvier.
	" "	Perturbation Atmosphérique des 15, 16, 17 Mars, 1873.
	" "	Sur un nouveau système de représentation d'observations météorologiques continues faites à l'observatoire national d'Alger. By M. Bulard, Director.
Brussels	Observatoire Royal	Annales, 1872, June to August; 1873, June and July.
Budapest	Centralanstalt für Meteorologie und Erdmagnetismus.	Jahrbücher, Band I, 1871. By Dr. Guido Schenzl, Director.
Calcutta	St. Xavier's College Observatory	Meteorological Register, July to December 1873. By Rev. E. Francotte, S.J.
Connecticut	Academy of Arts and Sciences	Transactions, Vol. ii. pt. 2.
Copenhagen	L'Institut Météorologique Danois.	Observations at Various Stations, December 1873.
	" "	Bulletin Météorologique du Nord, January 1st to February 28th, 1874. By Captain N. Hoffmeyer, Director.
Cracow	K. K. Sternwate	Meteorologische Beobachtungen, November 1873 to February 1874. By Dr. F. Karlinski, Director.
Edinburgh	Scottish Meteorological Society.	Journal, No. 40.
Fiume	I. R. Accademia di Marina	Meteorological Observations, October 1873 to January 1874.
Kew	Observatory	Report for the Year ending October 31st, 1873. By the Kew Committee.
Klagenfurt	Observatory	Meteorologische Beobachtungen, November 1873 to January 1874. By Dr. J. Prettner.
London	Art Union	Thirty-seventh Annual Report.
	General Register Office	Weekly Returns of Births and Deaths, 1873, Nos. 52, 53; 1874, Nos. 1 to 11.
	" "	Quarterly Return of Marriages, Births and Deaths, 1873, December 31st. By the Registrar-General.
	India Office	Account of the Operations of the Great Trigonometrical Survey of India, Vol. i. By the Secretary of State for India.
	Meteorological Office	Daily Weather Reports and Charts.
	"	Quarterly Weather Report, 1872, Part iv.; 1873, Part i.
	"	Report of the Proceedings of the Meteorological Congress at Vienna. By the Meteorological Committee.
	Royal Institution	Proceedings, No. 59.
	Royal Society	Proceedings, Nos. 148-150.

London	Victoria Institute	On the Geometrical Isomorphism of Crystals, and the Deviation of all other Forms from those of the Cubical System. By the Rev. Walter Mitchell, M.A.
Lyons	Commission de Météorologie.	Report, 1871.
Manchester ..	Literary and Philosophical Society.	Proceedings, January 13th to March 10th.
Marlborough ..	Marlborough College Natural History Society.	Eighteenth Half-yearly Report; Christmas 1873. By Rev. T. A. Preston, M.A., President.
Modena	Osservatorio della R. Università.	Sulle Variazioni non Periodiche della Pressione Atmosferica. Memoria del Prof. Domenico Ragona.
New York	University	Results of a Series of Meteorological Observations made under instructions from the Regents of the University at sundry Stations in the State of New York. Second Series. Prepared by Franklin B. Hough. By the Regents of the University.
Paris	Observatoire National ..	Bulletin International. By M. U. J. Le Verrier, Director.
	Observatoire Physique Central de Montsouris.	Bulletin Mensuel, December 1873 to February 1874.
	„ „ ..	Annuaire Météorologique et Agricole pour l'an 1874. By M. Marié Davy, Director.
Rome	Osservatorio del Collegio Romano.	Bulletino Meteorologico, December 1873, January 1874.
	„ „ ..	Prolegomeni allo studio delle burrasche del Clima di Roma, per Giuseppe Lais, D.O. By Padre Secchi, Director.
Sydney	Government Observatory	Meteorological Observations, July to September 1873.
	„ „	Results of Meteorological Observations made in New South Wales during 1872. By H. C. Russell, B.A., Government Astronomer.
Toronto	Education Office.........	Journal of Education, December 1873 to January 1874. By Rev. E. Ryerson, D.D.
Upsala	Observatoire de l'Université	Bulletin Météorologique Mensuel, Vol. v. Nos. 10-12. By M. H. H. Hildebrandsson, Director.
Victoria	Patent Office	Patents and Patentees, Vol. vi., 1871.
	„	Statistical Tables relating to the Colony of Victoria. By W. H. Archer, Registrar-General.
Vienna	K. K. Centralanstalt für Meteorologie und Erdmagnetismus.	Beobachtungen, December, 1873, to February, 1874. By Dr. C. Jelinek, Director.
	Oesterreichische Gesellshaft für Meteorologie.	Zeitschrift. Band ix. Nos. 1-6.
Washington ..	Smithsonian Institution	Annual Report of the Board of Regents, 1871. By Prof. J. Henry, Secretary.
	U.S. Geological Survey of the Territories.	Lists of Elevations in that portion of the United States west of the Mississippi River.
	„ „	Meteorological Observations during the year 1872 in Utah, Idaho and Montana.
	War Department	Report of the Chief Signal Officer for the year 1872. By Brigadier-General A. J. Myer, Chief Signal Officer.

Presented by Individuals.

Birt, W. R., F.R.A.S.	The Sailor's Guide; or short and easy Rules for V in revolving Storms. By W. R. Birt.
Colvin, V.	Report of a Topographical Survey of the Adiro Wilderness of New York. By Verplanck Colvin.
Corbett, Lieut-Col. A. F...	The Climate and Resources of Upper India, and su tions for their improvement. By A. F. Corbett, I Col.
Crossley, L. J.	Notice of the Gale of December 16th, 1873.
Delaney, John	Meteorological Observations at St. John's, Newf land, December 1873. (MS.)
Denning, W. F., F.R.M.S.	Rainfall in 1873 at Bristol.
Eller, Rev. I.	Comparative Yearly Summary of the Weather at Fal worth, 1867 to 1873. (MS.)
Forbes, Arthur	Meteorological Summary, Culloden, Inverness, Dece 1873 to February 1874. (MS.)
Higgs, Rev. W., LL.D. ..	The Telegraphic Journal and Electrical Review, No 27.
Hoskins, Dr. S. E., F.R.S.	Meteorological Observations taken at Guernsey, Ja to December 1873; January and February 1874.
" "	A Tabular Form of Analysis, to aid in tracing the po influence of past and present upon future states c weather. By Dr. S. E. Hoskins, F.R.S.
Merrifield, J. LL.D., F.R.A.S.	Meteorological Summary for the year 1873 at Plymo
Newton, J. W.	Weather Tables for January to March 1874.
Poëy, André	Rapports entre les taches solaires, les orages à Pari Fecamp, les tempêtes et les coups de vent dans l'A tique nord.
" "	Rapports entre les taches solaires, les tremblemen terre aux Antilles et au Mexique et les éruptions caniques sur tout le globe.
Power, Dr., R. E.	Meteorological Observations at Dartmoor, December to February 1874. (MS.)
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Sawyer, F. E.	Meteorology of Brighton, 1873.
" "	Summary of Meteorological Observations for 1873, Buckingham Place, Brighton.
Scott, William	Summary of Meteorological Observations made at laston, January and February.
Silver, S. W.	"The Colonies," Nos. 151-156.
Swainson, Rev. C., M.A.	A Handbook of Weather Folk-Lore. By Rev. C. Sv son, M.A.
Symons, G. J.	Symons's Monthly Meteorological Magazine, Janua March.
" "	Quarterly Return of Births, Deaths and Marriages r tered in Scotland, December 31st, 1873.
" "	An attempt to develop the Law of Storms by mea facts, arranged according to place and time, and h to point out a cause for the variable winds, witl view to practical use in navigation. By Lieut.-Col Reid. (2nd edition.)
Tarbotton, M. O., F.G.S.	Meteorological Observations at Nottingham, Nove 1867 to December 1870; January to December 187
" "	Register of Rainfall at Nottingham, November 18 December 1870; January to December 1873.
Presented by the Editors	'Food Journal,' No. 48.
Presented by the Editors	'Long Ago,' No. 14.
Presented by the Editors	'Nature,' Nos. 218-230.
Turtle, L.	The Weather at Aghalee during the months of Dece 1873, February 1874.
"	Abstract of Meteorological Observations for the 1873, taken at Aghalee.
Vivian, E.	The Climate of Torquay and South Devon. from Met logical Observations taken at Woodfield, Tor By E. Vivian.

p. 175), am convinced that we do not feel the full violence of tropical cyclones in these islands; we never dream of building storm rooms as a refuge when the rest of the house has vanished into thin air. Such a precaution is, or formerly was, sometimes taken in the West Indies.

To return to our subject of the relation of velocity to pressure or force, either measured or estimated, the most complete table I have been able to find hitherto is that given in Spon's Dictionary of Engineering, as an extract from the Edinburgh Encyclopædia; and there could not be a better example of the hopeless state of confusion into which the subject has been brought. I extract a few instances of pressures, velocities, and descriptions, with their respective authorities.

Pressure. lbs. per square foot.	Velocity. Miles per hour.	Description.	Authority.
9·963	49·69	Great storm	*Denham*
21·435	74·69	Great storm	*La Condamina*
46·875	107·80	Most violent hurricane	*Lind*
49·200	110·48	Hurricane that tears up trees and throws down buildings	*Rouse*
58·450	120·87	Observed by	*Rochon*

It is not said what the effect of the wind observed by Rochon was; if it did more than throw down buildings, it must have been hard to register its force!

In the Weather Book, Admiral FitzRoy gives a table contained in a letter from Mr. Glaisher (dated in 1858), in which the several degrees of the "land" scale (0-6) and their subdivisions are represented by pressures per square foot varying from 1 oz. up to 36 lbs. This, however, only shows that the land scale, as understood at the time the letter was written, was insufficient to represent the extreme forces of wind which may possibly occur; for, not to speak of the record at Bidston above referred to, we find that pressures up to 40 lbs. have, not very unfrequently, been registered (*e.g.* 42 lbs at Glasgow, January 24th, 1868). These, therefore, would correspond to forces above the highest figure of the scale. This leads us at once to the same absurdity as I have seen exemplified in certain old official registers, in which the scale (nominally Beaufort's) has been extended up to the figure 14, and therefore proceeds two grades beyond the force which can carry off all but the storm room of a house!!

The velocity corresponding to this maximum force of 12 in Beaufort's scale is given as 84·8 miles an hour; but we have recorded over 80 miles in an hour on more than one occasion, which probably corresponded to much higher velocities for part of the time, as the wind during storms is always gusty. We should also remark that neither the steamboat shed at Holyhead (November 23rd, 1872), nor Sandwick Manse, (February 27th, 1869,) were blown away, and so I am confident that 85 miles an hour does not correspond to the velocity of the wind in a tropical cyclone, and deem it probable that Sir H. James is not far from the mark when he gives 100 miles an hour as the highest figure of his scale.

The origin of the Beaufort scale is well known. It was devised by the late Sir F. Beaufort for use on board H.M.S. 'Woolwich,' when under his command in 1805.

As a really scientific scale it is affected by one capital defect, viz. that the standard of comparison does not remain the same for all the grades. In all the lower figures up to 4 (inclusive) the *speed of the ship* is the test of the force, in the higher figures it is *the amount of sail which the ship can carry* when "close-hauled," which forms the basis of the classification. This change of standard produces some inconvenience, as will be seen from the following remarks, taken from the Explanation to our Monthly Charts of Square 3, which is now in the press.

"Force 4 denotes a wind which will carry a well-conditioned ship-of-war "of the late Admiral Beaufort's time 5-6 knots an hour when "close hauled" "in smooth water, whilst 5 denotes a wind to which the same ship under "similar circumstances could just carry royals. Now it is well known that "such a ship, just carrying royals, in a smooth sea, might be going 9 or 1[illegible] "knots an hour, *i.e.* nearly double the speed represented by 4."

These observations show us that, strictly speaking, Beaufort's scale does not progress by equal grades. Nevertheless we find that this scale is practically employed by our telegraphic reporters as a sort of rough and ready subdivision of the several degrees of wind-force according to a rude arithmetical progression. These men are hardly ever in the position of actually watching full-rigged ships under sail, and so must only guess as best they can.

In order to test the extent to which the estimates of wind according to this scale made at our reporting stations accord with the velocities registered on the anemograms, if any exist at the station, we commenced by obtaining from the Lightkeeper at Holyhead Pier Lighthouse estimates of wind-force at certain hours, and comparing them with the anemograms recorded on the dome of the lighthouse itself. The results, for a period of 4 months in 1869-70, gave values which apparently afforded a fair basis of comparison for the middle forces.

The next attempt was at Great Yarmouth, where the anemograms for a period of 3 months were compared with the observations entered in the log of the Lightship at St. Nicholas Gat-way, lying about 1 mile off the coast. The Meteorological Office is indebted to the Trinity House for the loan of this record.

It was found that for certain points of the compass the results of this comparison agreed fairly well with those obtained at Holyhead, and accordingly the following scale has been provisionally adopted and used in the comparison of weather with storm signals in the years 1870-1-2 (Parliamentary Papers No. 504, 1871; 152, 1873).

Force, Beaufort Scale.		Approximate Velocity Miles per hour.
0 Calm		0—5
1 Light air	Or just sufficient to give steerage way	6—1[illegible]

Force, Beaufort Scale.				Approximate Velocity. Miles per hour.
2	Light breeze	Or that in which a well-conditioned man-of-war, with all sail set, and clean full, would go in smooth water from	1—2 knots	11—15
3	Gentle „		3—4 „	16—20
4	Moderate „		5—6 „	21—25
5	Fresh „	Or that to which she could just carry in chase, full and by	Royals, &c.	26—30
6	Strong „		Single-reefed topsails and topgallant sails	31—36
7	Moderate gale		Double-reefed topsails, jib, &c.	37—44
8	Fresh „		Triple-reefed topsails, &c.	45—52
9	Strong „		Close reefed topsails & courses	53—60
10	Whole gale	Or, that with which she could scarcely bear close-reefed main-topsail and reefed fore-sail		61—69
11	Storm	Or, that which would reduce her to storm-staysails		70—80
12	Hurricane	Or, that which no canvas could withstand		80 & upwards.

Lately my attention has been drawn by Mr. R. Strachan to Schott's discussion of Sir F. Leopold M'Clintock's observations in the 'Fox' (Smithsonian Contributions, No. 146). At page 39 we find a table of pressure and velocity of wind for a scale of 10 degrees of force, and Mr. Schott says:—

"The relation of the tabular numbers of pressure and velocity is in "accordance with Smeaton's table, and also agrees with that following from "Dr. Bernouilli's formula. By simple proportion, or by means of a diagram, "we obtain the following velocity numbers corresponding to Beaufort's scale, "or to a graduation from 0-12."

Force.	Velocity.	Force.	Velocity.	Force.	Velocity.
0	0	4	17	8	48
1	1	5	24	9	56
2	4	6	32	10	67
3	10	7	40	11	82
				12	100

These figures agree so very closely with those at which we, in the Meteorological Office, have arrived from independent observations, that I feel myself justified in proposing our scale for general adoption in all cases where it is required to employ anemometrical data for checking reports of wind in ships' logs, &c.

In consideration of the fact that, both at Leipzig and Vienna, it was resolved that the equivalent velocities in metres per second, I have subjoined the numbers, (to the nearest half metre,) referred to the latter units :—

Beaufort Scale.	Velocity. English miles per hour.	Velocity. Metres per second.
0	3	1·5
1	8	3·5
2	13	6
3	18	8
4	23	10
5	28	12·5
6	34	15
7	40	18
8	48	21·5
9	56	25
10	65	29
11	75	33·5
12	90	40

The velocity in metres per second is, roughly speaking, one half of tha English miles per hour. The actual factor for multiplication is 0·447.

I am of opinion that this scale may be assumed to be exact enough practical purposes, and there are most serious difficulties in the way of ı tuting a comparison thoroughly satisfactory from a scientific point of vie

Firstly, as already explained, a clipper ship, which may be considere correspond to Beaufort's frigate, can hardly be said ever to come fairly u the notice of our observers, and if she did she would probably have short sail when near enough to port to be observed; furthermore, the constant of double topsails does away in some measure with the test as to reefing

Secondly, the estimated force is usually made from an observation sel lasting more than 2 minutes, while the corresponding anemometrical vel is the number of miles of wind which passed the instrument from 30 mi before to 30 minutes after the time of estimation, so that it must necess result that, from the gusts and lulls which so constantly occur in the many of the separate observations will have attached to them more, many less, than the true hourly velocity (whatever that may be) v corresponds to them.

In very light airs and calms, as well as in extremely violent winds, difficulty is found in making a good estimation. It is also very rarel case that a correctly made and well-kept anemometer registers *no* wind f hour continuously, though perhaps for several *minutes* together the cup be quite stationary, and during this time the estimation may be ı There is also another consideration to be borne in mind with respe light variable airs. No matter how variable they are in direction, they duce but one result on the velocity trace of an anemometer, viz. a c amount of air registered as having passed the instrument. It thus com pass that what was (in considering the motion of the air currents) intents a *calm*, might cause a registry of some few miles of wind b anemometer, but from different directions.

Thirdly, the anemometers have never been really tested against each

so that we know not whether their indications are or are not comparable with each other.

Fourthly, the conditions of exposure of the anemographs exert an overwhelming influence on their action, so that one is led almost to doubt the possibility of our being able, to any useful purpose, to compare the data from any one of these instruments with those from another.

This latter fact will be self-evident if we take the actual figures of the two comparisons above referred to, viz. for Holyhead and Great Yarmouth, which have been made by one of our Fellows, Mr. F. Gaster, to whom I have been indebted for much assistance on the subject now under consideration.

For Holyhead the table is short, and it will be seen that the figures which may be held to possess value only extend from forces 1-7.

HOLYHEAD.

Force by Beaufort Scale.	No. of Comparisons.	Corresponding average Velocity.	Differences.
0 (calm)	14	4·9	
			5·7
1	48	10·6	
			4·7
2	55	15·3	
			4·0
3	61	19·3	
			4·8
4	48	24·1	
			5·5
5	65	29·6	
			6·4
6	66	36·0	
			7·5
7	55	43·5	
			8·3
8	10	51·8	
			4·6
9	8	56·4	
			5·6
10	3	62·0	
11, 12	No observations.		

At this station the instrument is erected on a pier at a distance of about 150 yards from the nearest house. The pier is at the entrance of the Old Harbour, and is, therefore, on the channel which divides the island of Holyhead from that of Anglesea. The Head is distant about three miles in a SW direction, and it certainly presents a considerable mass of high land to any wind from that quarter, but I am disposed to think that its effect on the velocity registered by the instrument is not great.

On the eastern side the land at the distance of about half-a-mile rises gradually to the height of about 200 feet. To the northward there is the bay, and to the SE the lowland and the channel above referred to. The land of Anglesea is flat, on the whole. Thus we see that there are no local conditions which materially affect the wind as regards the various points of

the compass, and that, on the whole, Holyhead may be taken as close approach to the conditions of a real sea exposure. It is well kr be the windiest station that we have; and this I attribute to its positi prominent headland at the entrance of the Irish Sea, while the high the hills of Wales forces the air to blow along the surface of St. G Channel.

We did not, however, rest satisfied with the assumption that the f the wind at Holyhead was uniform from all points of the compass, but the observations carefully by means of the reports from the observing at the South Stack Lighthouse, for a copy of which we were indebted Mersey Dock Board. The result showed that no local influence of si was traceable.

Let us now see what results we obtain from Yarmouth, where at fir we should imagine that the exposure would be equally good all round th pass, as the land to the westward is about as level as the sea to the ea I have already prepared you for the statement that such a suppositio justified by the facts of the case, by my remark that our estimat Beaufort Scale was taken *for certain points of the compass* for wh velocities agreed with those for Holyhead. The mean velocities for al were below those for Holyhead, as the following Table will show:—

YARMOUTH.

Force.	No. of Observations.	Average Velocity.
0 (calm)	3	1·7
1	21	4·1
2	27	8·2
3	77	10·4
4	162	13·6
5	132	16·8
6	90	23·7
7	61	28·2
8	20	32·8
9	6	28·8
10	6	33·0
11 and 12	None.	—

When, however, we take the observations from the separate points compass, we find the astonishing result that the velocities for the points are about one-half those for the eastern. (See Table I.)

The grounds of this discrepancy are to be found in the situation instrument. The town of Yarmouth lies in a N and S direction in tw the main town and the beach; the level of the latter being slightl than that of the former. The anemograph is on the top of the Home, one of the highest houses on the beach, and the cups ar 10 feet above the ridge of the roof, which is slightly below the leve roofs of the old town.

TABLE [illegible]

Direction of the Wind.	Average Velocity of Wind and Number of Comparisons. (Beaufort Scale Forces.) 0 (Calm.) No. of Obs.	0 (Calm.) Av. Vel.	1 Obs.	1 Vel.	2 Obs.	2 Vel.	3 Obs.	3 Vel.	4 Obs.	4 Vel.	5 Obs.	5 Vel.	6 Obs.	6 Vel.	7 Obs.	7 Vel.	8 Obs.	8 Vel.	9 Obs.	9 Vel.	10 Obs.	10 Vel.	11 and 12 Obs.	11 and 12 Vel.	Direction of the Wind.
North	—	—	—	—	—	—	2	11·5	1	14·0	3	18·3	2	29·0	3	37·7	2	37·0	1	30·0	—	—	No Observations recorded in the time.		North
NNE	2	2·0	5	3·0	1	8·0	—	—	—	—	2	28·0	6	37·8	4	40·8	2	47·5	—	—	—	—			NNE
NE	—	—	—	—	1	6·0	—	—	—	—	2	30·5	1	37·0	2	43·0	—	—	—	—	—	—			NE
ENE	—	—	—	—	2	8·0	7	13·7	6	22·2	3	28·0	1	36·0	—	—	—	—	—	—	—	—			ENE
East	—	—	3	5·7	—	—	3	11·3	5	21·2	12	26·8	1	32·0	—	—	—	—	—	—	—	—			East
ESE	—	—	—	—	—	—	—	—	2	15·5	1	31·0	1	34·0	1	38·0	—	—	—	—	—	—			ESE
SE	—	—	1	6·0	5	6·8	4	10·0	5	22·6	4	27·3	—	—	—	—	—	—	—	—	—	—			SE
SSE	—	—	1	6·0	3	11·0	3	11·7	16	17·8	8	21·1	—	—	—	—	—	—	—	—	—	—			SSE
South	—	—	2	3·5	—	—	10	9·4	5	14·8	8	17·1	6	22·8	9	30·7	2	31·0	—	—	—	—			South
SSW	—	—	—	—	2	8·5	11	10·2	16	12·3	8	18·5	13	22·2	3	26·0	—	—	—	—	—	—			SSW
SW	—	—	2	1·5	3	8·3	5	9·4	19	11·0	19	15·9	4	21·3	1	20·0	1	30·0	1	37·0	—	—			SW
WSW	—	—	—	—	4	7·8	7	9·4	33	12·2	26	15·4	17	23·1	9	28·1	3	32·0	—	—	—	—			WSW
West	—	—	3	6·0	2	8·5	7	10·1	24	13·1	14	15·7	10	21·8	9	28·0	2	35·0	—	—	1	46·0			West
WNW	—	—	2	5·0	1	9·0	9	9·1	14	12·2	13	15·8	19	22·0	13	28·2	4	33·0	—	—	—	—			WNW
NW	—	—	1	3·0	1	8·0	6	13·8	10	10·3	4	15·0	4	15·3	4	26·5	1	21·0	1	28·0	—	—			NW
NNW...........	1	1·0	1	1·0	2	9·5	3	7·0	6	10·6	5	12·3	5	16·2	3	24·0	3	25·3	3	26·0	5	30·4			NNW
North (repeated)	—	—	—	—	—	—	2	11·5	1	14·0	3	18·3	2	29·0	3	37·7	2	37·0	1	30·0	—	—			North (repeated)

N.B—The values for North are repeated at the bottom of this Table merely for the sake of more easy comparison with those for NNW.

There are no houses to the eastward; while to the westward, at a dis of not quite half-a-mile, there is the old town, connected by a few street the beach. To the NW, where the greatest retardation of velocity i served, there is, for some little distance, a space nearly completely ope

It appears to me that the reason of the great defect in the velocity west winds is caused by the fact that the wind, disturbed by the irr surface of the old town, comes against the houses on the beach, a thrown up by them and caused to pass over the roofs, so that the ar meter is more or less in an eddy, and does not feel the full force c current. With easterly winds the effect is less, as they come to the right off the sea.

Latterly, having been struck by the deficiency of the velocity of win corded at Falmouth during several gales, I have instituted a compa between the anemograph velocities from that Observatory and the i reported at the Eddystone, situated at a distance of 60 miles to the eas of Falmouth, and have again had to thank the Trinity House for the lo the Lightkeeper's log. The results of the comparison for four yea as follows:—

FALMOUTH AND EDDYSTONE.

Force.	No. of Observations.	Average Velocity.
		Miles.
0 (calm)	55.	6·5
1	383	7·5
2	695	10·2
3	1009	13·6
4	948	18·2
5	575	23·7
6	398	28·5
7	373	33·4
8	167	36·9
9	46	43·3
10	20	50·2
11	4	54·8
12	1	60·0

These figures prove that the velocities at Falmouth are, speaking gene at least 20 per cent. below those at Holyhead for the respective gra the scale; but the difference is not uniform.

The next step was to examine into the effects of the varying directi the wind on the result, and Table II. was thus obtained.

These figures show that there is no great difference between the velo registered from the various points of the compass, and accordingly the r for Falmouth present a strong contrast to those for Yarmouth; but it not be forgotten that the materials available for forming the opinion i case of Falmouth were much more copious than in the former case.

This result has surprised me very much, for the position of the instru at Falmouth is a very exceptional one. The anemograph is erected o

TABLE II.—FALMOUTH AND EDDYSTONE.

Direction of the Wind.	Average Velocity of Wind and Number of Comparisons. (Beaufort Scale Forces.)																										Direction of the Wind.
	0 (Calm.)		1		2		3		4		5		6		7		8		9		10		11		12		
	No. of Obs.	Av. Vel.	Obs.	Vel.	Obs.	Vel.	Obs.	Vel.	Obs.	Vel.	Obs.	Vel.	Obs.	Vel.	Obs.	Vel.	Obs.	Vel.	Obs.	Vel.	Obs	Vel.	Obs.	Vel.	Obs.	Vel.	
North	2	8·0	41	7·3	51	9·5	67	12·1	63	18·0	46	20·8	22	26·9	7	29·7	2	39·0	—	—	—	—	—	—	—	—	North
NNE	1	9·5	8	7·3	25	8·7	30	11·9	30	15·2	8	18·2	4	26·8	—	—	—	—	—	—	—	—	—	—	—	—	NNE
NE........	—	—	37	6·0	46	6·5	49	9·2	45	15·8	56	20·5	36	24·7	14	32·3	10	40·0	1	44·0	—	—	—	—	—	—	NE
ENE	1	5·5	10	5·3	39	8·4	52	11·7	52	15·6	41	22·3	42	28·4	29	32·2	12	34·6	2	43·0	—	—	—	—	—	—	ENE
East	1	4·5	38	6·2	47	9·7	96	12·2	116	18·4	65	23·3	21	30·0	16	33·9	9	37·1	1	38·0	—	—	—	—	—	—	East
ESE	5	5·4	16	7·4	40	8·5	49	12·7	26	16·0	9	28·1	14	29·2	4	33·3	2	33·0	—	—	—	—	—	—	—	—	ESE
SE	9	6·1	40	6·5	47	10·1	29	13·4	34	19·4	27	26·1	14	32·4	12	40·5	3	42·0	—	—	—	—	—	—	—	—	SE
SSE	10	5·3	9	7·8	16	9·5	14	15·2	31	19·3	7	21·1	12	29·3	19	33·7	3	35·3	1	22·0	—	—	2	57·5	—	—	SSE
South	2	3·5	39	9·0	21	11·1	34	13·6	43	20·4	30	26·7	31	27·4	44	31·5	24	36·1	12	42·8	7	50·6	—	—	—	—	South
SSW	2	6·0	8	6·6	26	9·8	36	15·1	55	18·6	27	25·4	25	29·3	36	32·3	23	34·5	4	43·3	2	47·0	1	49·0	—	—	SSW
SW	1	4·5	29	7·6	47	11·2	91	14·0	78	19·0	60	24·9	54	29·6	71	34·5	29	36·9	8	43·8	5	51·2	1	55·0	1	60·0	SW
WSW	4	5·4	19	8·9	49	10·7	94	14·3	103	18·2	49	22·1	46	27·4	55	30·7	16	33·2	6	43·8	5	51·6	—	—	—	—	WSW
West	1	2·0	35	9·3	84	12·4	102	14·8	61	18·1	56	23·4	30	29·3	27	36·0	16	37·4	5	40·6	1	42·0	—	—	—	—	West
WNW	3	7·0	20	8·9	52	10·7	89	15·4	71	17·9	38	26·9	25	28·5	16	35·4	11	42·5	4	54·8	—	—	—	—	—	—	WNW
NW	7	8·1	23	8·2	66	10·1	101	15·2	80	19·2	33	26·4	13	30·2	16	36·1	2	39·0	2	41·0	—	—	—	—	—	—	NW
NNW	6	10·2	11	8·7	39	14·0	76	14·1	60	18·7	23	25·5	9	30·8	7	39·3	5	47·4	—	—	—	—	—	—	—	—	NNW
North .... (repeated)	2	8·0	41	7·3	51	9·5	67	12·1	63	18·0	46	20·8	22	26·9	7	29·7	2	39·0	—	—	—	—	—	—	—	—	North (repeated)

top of a tower specially built for it. The tower is on the brow of the hill c which the town is built. The ground slopes steeply to the harbour on tl eastern side, and more gently to the sea on the southern; while to the wes ward and northward, the land is nearly on a level with the base of the towe The height of the tower is apparently sufficient to raise the cups above tl disturbing influences of the adjoining houses, to which action I have s tributed the anomalous results for Yarmouth; but still the fact remain that less wind is apparently felt at Falmouth than at Holyhead, and tl circumstance I decidedly attribute to the more insular position of the latt station.

The above figures are far from being conclusive; but I have deemed advisable to lay them before the Society, as they may have the effect calling the attention of meteorologists to the extreme caution which must l used in drawing conclusions from anemometrical data. Years ago, Admi FitzRoy pointed out the great effect in retarding air motion which was pr duced by the passage of the air from a coast station to one inland, and y it has been considered enough to prescribe that the anemometer should erected at a sufficient height above the ground, or that "much care" shou be used "in selecting positions for anemometers."

It appears to me that, in the present state of our knowledge, although may attempt, as Mr. Balfour Stewart suggested at the British Associati Meeting at Exeter, to establish a relation between the imports and expo of air of a certain constitution into and out of the country, we are as y without the means of gauging these imports and exports with much preter to accuracy, and much smuggling must infallibly take place. No one c say that the relation between the anemographic indications at Yarmou and Holyhead has been established with the requisite accuracy.

Professor Dove, in his Klimatologische Beiträge II., has taken t anemometrical results for Liverpool, Oxford, and Kew, as a fair represen tion of the motion of the atmosphere over the United Kingdom. The fa I have now submitted tend to show how utterly unsafe such a generalisati must be. The results from Valencia, Holyhead, and Sandwick, would gi entirely different figures from those obtained from inland observatories li Oxford and Kew.

DISCUSSION.

Mr. STRACHAN said that after reading the account of the experiments on for and velocity of winds in the Quarterly Weather Report for 1870, he compar the values for Beaufort's scale, in miles per hour, given by various meteorologis Sir W. S. Harris, Sir H. James, Schott, Neumayer, Laughton, and from these, t gether with the results of experiments published by Mr. Scott and Mr. Sto drew up for his own use a table of equivalents, which he was glad to find did n differ materially from that now proposed by Mr. Scott. When discussing for tl Smithsonian Institution the Arctic observations made on board the 'Fox,' cor manded by Sir L. M'Clintock, Schott deemed it necessary to convert the grad of wind force into miles per hour, in order to compute certain resultants which wished to obtain. He states that the equivalents which he used were deduc from a formula by Bernouilli. It is satisfactory to hear that the equivalents d termined experimentally agree closely with those deduced from theory.

Undoubtedly, it is not theoretically correct to average the Beaufort grades of force; but practically it may be done without material error, especially if the observations are rather numerous. He had, in course of some work under Mr. Scott's direction, followed Schott's plan of converting each grade into equivalent miles per hour, and thence deduced resultants for a number of groups of wind observations. He afterwards calculated the resultants directly from the grades, considering of equal unit values, or to have a common difference. He was surprised to find that the difference between the two results was in no instance of any importance. Although formerly of a different opinion, he now thought that for all practical purposes meteorologists did right in averaging the grades of wind force. To treat them otherwise was straining after theoretical accuracy which was hardly attainable; for, after all, the scale was only a rough and ready one. However, its value was evident from the general use made of it. Beaufort, probably, merely aimed at reducing to a simple and concise system the mode of estimating the wind force in practice in his day. His designations of the winds as 'gentle,' 'fresh,' 'strong,' &c., are the terms used in writing up ordinary sea logs even to this day. Those who have had experience in examining logs of the present day, and those as far back, say, as the time of Nelson, must have noticed the consistency with which these words have been used by the generality of seamen for the last eighty years at least. Beaufort's wind scale, in common with his weather notation, tended to do away with a large amount of writing, superseding tedious verbosity by perspicuity and brevity. In fact, he introduced a sort of shorthand, easily acquired and exceedingly useful to seamen, saving time in writing and reading, and favouring conciseness where a tendency to prolixity prevails. Indeed, the merits of Beaufort's system are not even yet sufficiently understood and practised by merchant seamen. In the Navy no other is tolerated.

CAPTAIN TOYNBEE thought that it was right to append certain names, such as "light breeze," "strong breeze," "moderate gale," "whole gale," &c., to the figures of Beaufort's scale, because observers on shore, and even keepers of lighthouses and light-ships, must be very much guided by them, as they seldom or never saw ships under the amount of sail which the force of wind would permit them to carry, for they were generally under easy sail when near the land.

He also thought that a simple instrument which would record the number of revolutions made in a certain time, would be a useful appendage to land stations, by helping the observer to report more accurately the force of the wind. It might be raised on a pole several feet from the surface of the ground or top of a building, the pole being light enough to be raised and lowered by hand. Of course its records would be, to a certain extent, influenced by the friction of the air against the earth's surface, and the various objects upon it; still it is a question whether (taken together with the motion of lower clouds, and the action of the wind on the tops of trees, smoke, &c.) it would not give a more correct result, especially as to the relative forces of winds at different stations, than that attained without it.

Dr. TRIPE said it was evident that anemometers should be tested against each other, but great care would have to be used in making the comparisons. Thus, in confirmation of the remark by Mr. Scott, that the shed at Holyhead was not disturbed during the gale, he would mention that a hurricane in passing through a forest sometimes knocks down the trees and cuts a clean path through it of one or more hundred feet wide, leaving the other trees standing quite uninjured.

The PRESIDENT remarked that he had seen, with some interest, the care that is taken to test, and render exact, the performance of the excellent small anemometer known under the somewhat odd name of Casella's Air Meter. Each instrument is mounted on the outer extremity of a long radial arm, which is carried round by machinery in still air, and stopped automatically after a given number of revolutions at the same instant that the wheels of the meter are clamped. Mechanical adjustments and compensations are applied to render the indications exact; and the performance of the instrument, after the application of this test and correction, is certainly marvellous for its uniformity and sustained performance.

Mr. LAUGHTON said that the middle numbers on the scale proposed by Mr. Scott were quite in accordance with his own ideas; but that he differed as to the numbers near the extremes. He thought it doubtful whether a wind of 5 miles

an hour could be called a *calm;* and that if, in time of calm, the anemomet registered 5 miles, this must be owing to irregular puffs of short duration: (the other hand, that the highest limit was fixed too low,—that in tropical cyclon the velocity of the wind frequently exceeds 90 or 100 miles. Taking into accou the damage done in such storms, Mr. Thom had maintained that the velocity the wind often exceeded even 120 miles. He would be inclined to begin at 2 miles for force 1, and taking 120 miles for force 12, interpolate for the interveni numbers in a sort of irregular geometric progression. It was, perhaps, wor calling attention to an American story which had appeared in the papers a fe days since, of an ice boat having sailed at the rate of 120 miles an hour, in wh was described as a strong wind,—not even a gale. With every allowance f exaggeration, it would appear that the number on Mr. Scott's scale was much e ceeded: unless, indeed, the story—which, so far as he knew, was quite unauthent cated—was altogether a myth.

Mr. LECKY said that the rate at which the ice ship went was not correctl stated, it was 1¼ mile in 31 seconds. He also mentioned, that some years ag he frequently travelled on an engine in Ireland which was going at the rate 60 miles an hour, which was equal to what a sailor would term a "whole gale."

Mr. SYMONS was of opinion that objects on the land throw the wind in waves and cause undulations. The height of the anemometer above the groun was a very important point, as is shown by the anemometers at Strathfield Tu giss, where that placed on the ground records but a very small percentage that indicated by an identical instrument placed on a post 25 feet high. Wi reference to Dr. Tripe's remark that it is sometimes stated that during a ga some trees are knocked down while others close by are missed, he did not kno how to account for it. There was another point: anemometers require to be oile so very frequently, and some are quite coated with a compound of oil and soo He had no doubt, from what he had seen, that one of the many causes of diver anemometric records was the variability in the attention to cleanliness on th part of the observers in charge. He believed anemometers rarely had fair play for though they might be right on the day they were cleaned and oiled, their i dications became daily more erroneous until the process was repeated.

Mr. GASTER thought that lighthouse keepers were not entirely without excu for putting down force higher than 12, as the designation for force 12 is merel "that in which a ship can carry no canvas"; but it is evident that such a for might be very much exceeded, for instances are not wanting to prove that shi have been unable to carry even their lower masts, but have had to cut the away.

Mr. SCOTT stated, with regard to Mr. Strachan, that the comparisons of th Beaufort scale with velocity to which he referred had been made for a paper c the meteorological conditions of Kerguelen Island, prepared at the request the Astronomer Royal in connection with the Transit of Venus. In answer Captain Toynbee, he observed, that the Eddystone was the nearest satisfacto station he could find to Falmouth. He had recently seen a small ha Robinson's anemometer, devised for use at sea on board the Austrian Nav which could be thrown out of gear by a trigger at any moment, and could th be read and give the velocity for a definite period. This instrument was bei tested at Kew. The local winds of great violence, to which allusion had be made, were probably whirlwinds. As to Mr. Laughton's remark that real caln should be noticed, he would only observe, in addition to what had been said the paper, that at Vienna it had been decided to consider all winds of a veloci of less than half a metre per second as calms. Half a metre per second is abo one mile an hour, but he (Mr. Scott) considered that 3 miles an hour was hardl appreciable as a breeze. He doubted the accuracy of the reported velocity the ice ship. In regard to Mr. Lecky's observation, he had to remind the Socie that Dr. Robinson had tried his original anemometer on an engine running along measured distance on the Dublin and Kingstown Railway, and had found that was necessary to place the cups on a pole and carry them at a distance, laterall or vertically, of 11 feet from the engine in order to register the true velocity ru It was interesting to hear Mr. Symons's remarks about the *ricochet* of the wind in some experiments at present being carried on at Kew it had been found th an anemometer placed about 10 feet above the ground, sometimes registered abo one half that recorded on the dome of the Observatory.

In further illustration of the peculiar action of the wind in apparently picking out certain trees and leaving others, he thought that it would be interesting to state the following fact, which he had heard from his friend Mr. R. Mallet, F.R.S.

A chimney, 98 feet in height, was erected in the summer of 1838 at the Victoria Foundry Works, Dublin, to which was attached a lightning conductor, consisting of copper tubing. Mr. Mallet gives the following account of what took place during the great storm of January 1839:—"During a large portion of that formidable storm, which began about 8 p.m. and lasted throughout the whole of the intensely dark night until 9 or 10 the next morning, I quite expected the chimney to fall. When daylight dawned, however, it was still seen standing uninjured; but the lightning conductor was torn asunder at one of the soft solder joints, and a piece above that of some 8 or 9 feet long was observed standing out horizontally, or nearly so, from the shaft, at a height of about two-thirds of the whole above the base. It is by no means certain that the soft solder joint at which the parting took place was sound at the time of the gale of 1839, or whether it had previously lost its hold by expansion or contraction of the tube, or by previous oscillations of the chimney; its surfaces, however, were found sufficiently bright to suggest the idea that it had been ruptured, as well as the piece of tube blown out horizontally, in this gale. The bending of the tube took place a few inches below the first bronze staple above the place of separation; as it stood out from the shaft the next morning it was seen that the tube at this place had not only been bent but twisted as it rose from its vertical position; and this flattening and twisting of the tube at the bend was what gave it sufficient stiffness there to continue standing out against the weight of the nearly horizontal part.

"The storm began from the westward, veered round to the northward, lulled, and then began to blow from the southward, as nearly as I can remember. As the time at which the tube was thus wrenched out of its position could not be known in the darkness, so it is impossible to say with certainty (even were I quite certain whether the tube stood at the north or west side of the shaft) in what direction the wind was blowing at the moment when the event took place. As well as I can remember, however, the conductor was on the north side of the shaft, and the piece bent away stood out towards the east and a little to the northward, and if so, the actual blowing out horizontally must most probably have taken place towards the latter end and worst portion of the northern direction of the cyclone; it being also probable that the joint of the tube was for some time previously broken, and left hanging loose at its lower end by having been unsocketed from the part of the tube below by previous oscillations of the chimney."

XI. *On the Sensitiveness of Thermometers.* By G. J. Symons, F.M.S.

[Received February 14th.—Read March 18th, 1874.]

The author's attention was drawn to this subject by some remark smade at the Bradford Meeting of the British Association, and he was induced to attempt to determine (1) the relative sensitiveness of mercurial and spirit thermometers when the bulbs were of similar size and shape; (2) whether the increase of sensitiveness with decrease of size of bulb followed any regular law; (3) whether this latter condition differed according to the material employed; (4) as considerable interest is now taken in different forms of spirit minimum thermometers, the author resolved upon including a specimen of Mr. Hicks's hollow cylinder, and of Mr. Casella's bifurcated; (5) as cylin-

drical bulb mercurial thermometers are supposed to be very supe
spherical ones, he decided upon trying one. Fourteen thermomete
used, of which full particulars are given in the following table.

	Maker's Number.	Material.	Shape of Bulb.	Diameter. In.	Remarks
I.	19414	Spirit	Spherical	0·91	
II.	19415	"	"	0·74	
III.	19416	"	"	0·65	
IV.	19417	"	"	0·56	
V.	19413	"	"	0·44	
VI.	5441	"	Hollow cylinder	out 0·48, in 0·30	Length of bulb
VII.	19420	"	Bifurcated	0·13	Length of each
VIII.	19411	Mercurial	Spherical	0·69	
IX.	19408	"	"	0·58	
X.	19407	"	"	0·42	
XI.	19410	"	"	0·37	
XII.	19412	"	"	0·31	
XIII.	10280	"	Cylinder	0·22	Length 0·60
XIV.	19409	"	Spherical	0·23	

All the thermometers were divided on their own stems and were
quality, the double cylinder and the bifurcated minimum being fin
mens of glass blowing.

As it was felt that a test in water alone, or in air alone, might not
the facts of the case, it was resolved to divide the experiments i
series, one series being in water, the other in air.

The water series were conducted as follows:—An ordinary glass te
holding about 3 gallons, was nearly filled with water at a temperature
100 degrees; another jar was filled with water at about 50 degrees, an
all the thermometers were placed. Precautions were taken to preve
arising from the cooling of the water in the warmer jar.

One thermometer at a time was taken from the cold jar, immerse
warm one, and read each five seconds until it had attained the true t
ture of the warm water.

It was then cooled down to its original point, and another series of
were taken, after which the same process was repeated. Each then
was therefore tried three times.

Table I. contains an abstract of the results, and shows the act
average time occupied by each thermometer in taking up the tru
temperature.

TABLE I.

Period required to assume true Water Temperature.

Spirit.					Mercury.				
No.	Time.				No.	Time.			
	1st Obs.	2nd Obs.	3rd Obs.	Mean.		1st Obs.	2nd Obs.	3rd Obs.	Mean.
	Seconds.	Seconds.	Seconds.	Seconds.		Seconds.	Seconds.	Seconds.	Seconds.
I.	205	220	185	203	VIII.	30	35	40	35
II.	170	175	155	167	IX.	40	40	60	47
III.	105	115	110	110	X.	55	40	30	42
IV.	115	90	115	107	XI.	25	30	20	25
V.	95	110	85	97	XII.	20	30	25	25
VI.	35	40	40	38	XIII.	20	20	20	20
VII.	45	35	40	40	XIV.	15	15	15	15

The air series were taken in a very similar manner. The thermometers were all placed in a room of which the temperature was 70°, and were then removed to a temperature of about 48°, and read each half minute until they fell to the air temperature.

In order to avoid burdening this paper with unnecessary figures, only the readings at the even minutes are entered in Table II. (page 126), which epitomises this series of observations.

It will be noticed that the first correct reading of each thermometer is in Egyptian type in order to call attention to the time (stated at the head of the column) at which it occurred. Table III. gives an epitome of these results, and reduces the retardation, due to largeness of bulb and employment of spirit, to distinct measurement.

TABLE III.

Period required to assume true Air Temperature.

No.	Material.	Time. Min.	No.	Material.	Time. Min.
I.	Spirit	20	VIII.	Mercury	13
II.	"	19	IX.	"	11
III.	"	17	X.	"	10
IV.	"	16	XI.	"	6
V.	"	16	XII.	"	6
VI.	"	7	XIII.	"	7
VII.	"	7	XIV.	"	6

It will be seen that *in air* a pea-bulb mercurial thermometer falls to the true temperature (true to 0°·1) in 6 minutes, while a spirit thermometer, with an ordinary bulb, will be 16 minutes and, with a 0·9 inch bulb, will be 20 minutes. In *water* the difference is still more marked, the retardation for the same three thermometers being 15, 100 and 200 seconds respectively. So that while in air the ratio of retardation is 100 : 266 : 338, in *water* it is 100 : 666 : 188.

TABLE II.

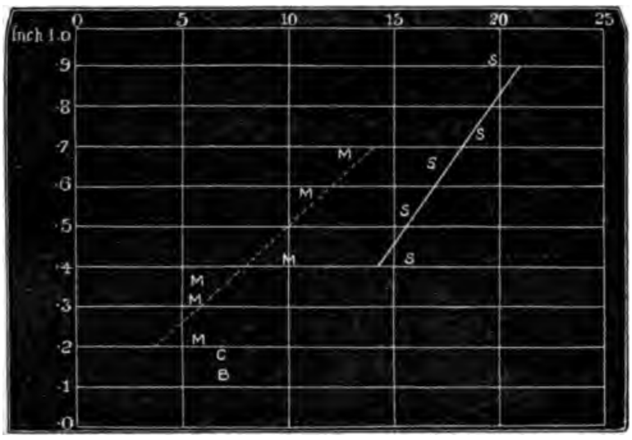
Readings of Thermometers exposed to Cold Air.

Minutes.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
I.	68·0	64·4	61·9	59·1	57·1	55·6	54·1	53·0	52·1	51·4	50·9	50·2	49·8	49·5	49·1	48·9	48·6	48·5	48·4	**48·3**
II.	66·8	62·7	59·6	56·8	55·0	53·3	52·1	51·1	50·5	50·0	49·5	49·1	48·8	48·6	48·5	48·3	48·2	48·1	**48·0**	
III.	66·2	61·4	58·2	55·0	53·1	52·0	50·8	49·9	49·2	49·0	48·5	48·3	48·1	48·0	48·0	47·9	**47·8**			
IV.	63·6	58·9	55·8	52·9	51·2	50·2	49·3	48·8	48·4	48·2	48·1	48·0	47·8	47·8	47·8	**47·7**				
V.	63·0	57·9	54·6	51·6	50·3	49·4	48·8	48·4	48·1	48·1	48·0	48·0	47·8	47·8	47·8	**47·7**				
VI.	67·1	57·2	52·9	50·0	48·5	47·8	**47·6**													
VII.	65·0	53·0	50·0	48·6	48·0	48·0	**47·9**													
VIII.	70·4	63·9	58·5	55·0	52·3	50·9	50·0	49·2	48·8	48·4	48·1	48·0	**47·9**							
IX.	70·3	63·7	58·0	53·9	51·3	50·0	49·3	48·6	48·2	48·0	**47·8**									
X.	70·0	60·6	53·9	50·8	49·0	48·3	48·1	47·8	47·7	**47·6**										
XI.	68·2	56·0	51·5	49·1	48·2	**47·9**														
XII.	68·9	55·6	50·7	48·6	47·8	**47·5**														
XIII.	70·5	57·9	51·4	49·3	48·2	48·0	**47·8**													
XIV.	67·8	53·4	49·5	48·0	47·8	**47·6**														

Decrease per Minute.

	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	
I.	3·6	2·5	2·8	2·0	1·5	1·5	1·1	0·9	0·7	0·5	0·7	0·4	0·3	0·4	0·2	0·3	0·1	0·1	0·1	
II.	3·1	3·1	2·8	1·8	1·7	1·2	1·0	0·6	0·5	0·5	0·4	0·3	0·2	0·1	0·2	0·1	0·1	0·1		
III.	4·8	3·2	3·2	1·9	1·1	1·2	0·9	0·7	0·2	0·5	0·2	0·2	0·1	0·0	0·1	0·1				
IV.	4·7	3·1	2·9	1·7	0·9	0·9	0·5	0·4	0·2	0·1	0·1	0·2	0·0	0·0	0·1					
V.	5·1	3·3	3·0	1·3	0·9	0·6	0·4	0·3	0·0	0·1	0·0	0·2	0·0	0·0	0·1					
VI.	9·9	4·3	2·9	1·5	0·7	0·2														
VII.	12·0	3·0	1·4	0·6	0·0	0·1														
VIII.	6·5	5·4	3·5	2·7	1·4	0·9	0·8	0·4	0·4	0·3	0·1	0·1								
IX.	6·6	5·7	4·1	2·6	1·3	0·7	0·7	0·4	0·2	0·2										

The following diagram represents graphically the results obtained; and as it was impracticable to obtain thermometer bulbs of exactly identical size, the dotted lines have been drawn through what the author thinks the most probable values for other dimensions. If these dotted lines be accepted as approximations to the truth, we are in a position to compare the relative retardation



of mercury and spirit in spherical bulbs. On this hypothesis, we should have the values in the first five columns of Table IV.; and if we divide the second by the fourth, and the third by the fifth, we get an approximate measure of the superiority of mercury over spirit, viz. that *in air* large spherical mercurial bulbs are only better than spirit in the ratio of 1¼ to 1, but that small ones in air are better in the ratio of nearly 2 to 1, and mercurial bulbs of *any size* in water are better than spirit in the ratio of 3 or 4 to 1.

TABLE IV.

Comparative Retardation of Spirit and Mercurial Thermometers.

Diameter.	Spirit.		Mercury.		$\frac{A.}{C.}$	$\frac{B.}{D.}$
	Air A.	Water B	Air C.	Water D.		
In.	Seconds.	Seconds.	Seconds.	Seconds.		
0·9	1240	200				
0·8	1170	175				
0·7	1100	150	840	40	1·31	3·75
0·6	1020	125	720	35	1·42	3·57
0·5	950	100	600	30	1·58	3·33
0·4	880	75	480	25	1·85	3·00
0·3			360	20		
0·2			240	15		

The first of these results is confirmed by an independent and differently arranged set of readings, which though vitiated by a rise of air temperature during the experiments, are yet worthy of record. The thermometers em-

ployed were (1) Casella's bifurcated spirit, VII.; (2) a spherical spirit thermometer 0·74 inch in diameter, II.; (3) a spherical mercurial thermometer 0·69 inch in diameter, VIII.

Readings.					Readings.				
No.	VII.	II.	VIII.	Excess of Mercury over Spirit.	No.	VII.	II.	VIII.	Excess of Mercury over Spirit.
Minutes.	°	°	°	°	Minutes.	°	°	°	°
0	49·3	49·0	51·5	2·5	10	65·8	60·3	62·1	1·8
1	56·3	50·8	51·7	0·9	11	65·8	60·9	62·6	1·7
2	58·7	52·0	53·0	1·0	12	65·9	61·6	63·0	1·4
3	60·6	53·2	54·6	1·4	13	66·3	62·0	63·7	1·7
4	62·0	54·4	56·0	1·6	14	66·4	62·3	64·0	1·7
5	63·0	55·6	57·3	1·7	15	66·5	62·6	64·3	1·7
6	63·9	56·6	58·6	2·0	16	66·5	63·0	64·8	1·8
7	64·5	57·7	59·6	1·9	17	66·6	63·5	65·2	1·7
8	65·0	58·7	60·5	1·8	18	66·6	63·9	65·3	1·4
9	65·2	59·4	61·3	1·9	19	66·6	64·0	65·6	1·6

From this it appears that with two bulbs of nearly equal size the mercurial is rarely 2°·0 ahead of the spirit, even though both be 8° or 10° below the temperature of the air in which they are exposed.

The next points which the author hoped to solve are seriously complicated by some undetermined cause, most probably variation in the thickness of the bulbs of the thermometers. Although, therefore, a very superficial examination of the results indicates that the retardation is probably, as might have been expected, a simple function of the diameter of the bulb and of the material employed, it may be better not to attempt to formulate it.

The author has been agreeably surprised at the excellent performance of the two varieties of sensitive minimum thermometers lately introduced. It will be seen by reference to Tables I. and III. that they are more than twice as sensitive as the smallest spherical spirit bulbs yet employed, and actually more so than mercurial bulbs 0·4 inch in diameter. There does not appear to be much difference between the two patterns.

Lastly, it appears that a cylindrical mercurial bulb is more sluggish than a spherical one of the same diameter (unless, indeed, the glass of the one experimented with is exceptionally thick). It must, however, be remembered that, as its contents are nearly three times that of the spherical, its column can be much bolder, or its degrees much longer.

[Note added March 16th, 1874.]

From such subsequent trials as time has permitted since drawing up the foregoing paper, I am inclined to think that the comparisons in air should be made both in absolutely still air and also in a current of known velocity; for

ample, by using Babinet's apparatus, driven at a known rate, or by an irator. The "air" results given above were obtained in calm air, but ssibly not sufficiently protected from draughts.

G. J. S.

DISCUSSION.

Mr. WILSON wished to know how one could measure the thickness of the wall the bulb.

The PRESIDENT said he suspected the inequalities in the thin film of the glass uld make the measurement of the thickness of the wall of the bulb a matter some delicacy and difficulty, although he believed that it might be accomshed.

Mr. SYMONS said that he had not sufficient time to go more fully into the oject; but if any Fellow was willing to take the instruments and go on with experiments, he would be happy to lend them.

XII. *On the Weather of Thirteen Autumns.* By R. STRACHAN, F.M.S.

[Received February 17th.—Read March 18th, 1874.]

Remarks on the Observations.—The observations used in this discussion re made in the years 1861-4, at 7 Arthur Street, Gray's Inn Road; since 64, October 1st, they have been continued at 11 Offord Road, London, orth. The latter place is nearly a mile and a half north of the former. e instruments used belong to the Meteorological Office, as I undertook to nish observations for Admiral FitzRoy. They were all verified at Kew servatory. The same barometer has been used throughout, and its readings ve been corrected for error, for temperature, and reduced to sea-level. The all errors of the thermometers have not been allowed for; hence, as these struments tend to read too high with age, the values for temperature are obably about half-a-degree too great. The rain-gauge is eight inches in ameter, its rim is nearly two feet above the ground, and its height above seavel about ninety feet. The force of wind has been estimated by Beaufort's ale; and, although theoretically it does not appear proper to average the ades of this scale, as its units are not intended to be of equal value, neverless I have convinced myself that for all practical purposes of averages units may be considered equal, and may therefore be averaged in the usual nner. In the course of a rather extensive investigation, as an experiment, I verted the Beaufort grades into miles per hour before calculating the d's resultants, and then I used the grades themselves and obtained results nearly identical as to show the uselessness of converting them. The weather also been recorded by Beaufort's notation, which recommends itself to meteorologist from its comprehensiveness and brevity. The observations e used, with the exception of those on the general state of the weather for h day, were made between half-past 8 and 9 a.m.; most frequently at the er time. I regret that I have made no systematic record of the character amount of clouds; however, I believe that a fair approximation to the mean ount of cloud may be obtained from the notations for "blue," "cloudy"

and "overcast" sky, by assuming $b=2$, $c=6$, $o=9$: thus the mean amou[illegible] cloud for September may be found as follows—

$$\frac{4\,b+16\,c+10\,o}{30}=\frac{8+96+90}{30}=6\cdot5$$ (on the usual scale, 0 to 10 for cloudine[illegible]

The letters for the weather signify, *b*, blue sky, less than three-tenths of [illegible] sky covered by light clouds, commonly called clear weather; *c*, detac[illegible] clouds covering from four-tenths to seven-tenths of the sky, commonly ter[illegible] cloudy weather; *o*, overcast, when more than eight-tenths of the sk[illegible] covered with continuous cloud, commonly termed overcast, dull or glo[illegible] weather; *m*, mist, or decided haze; *f*, fog; *r*, rain at time of observati[illegible] *lt*, thunderstorm.

The observations to which exception may be taken are those of the th[illegible]mometers and rain-gauge. The position of these instruments was certai[illegible] not such as a meteorologist would desire, but it was the best available; [illegible] it is believed that the observations fairly represent the temperature [illegible] amount of rain for the interior of London. Offord Road lies nearly east [illegible] west; the front of the house faces south; and the thermometers are pla[illegible] against the wall facing north, in a louvre boarded screen, four feet from ground. The early and late sun shines upon the screen only when the [illegible] rises and sets to the north of the east and west points. Check instrume[illegible] have been tried in other positions frequently, but this position has been fou[illegible] the best. The rain-gauge is in the middle of the garden; and at the cen[illegible] of its aperture the house, which is 40 feet high, subtends an angle of 6[illegible] a wall to the north, 15 feet high, subtends an angle of 50°; the e[illegible] and west walls, about 4 feet high, subtend respectively angles of 28° a[illegible] 20°. The length of the garden is 36 feet by 18 wide. There are [illegible] buildings higher than the north wall between the house and the North Lond[illegible] Railway, about 250 feet distant, nor for a like distance beyond. On t[illegible] whole, the shelter is greatest to the south. The observations made at Arth[illegible] Street were under very similar circumstances, except that the shelter wa[illegible] greatest from the east, to which point the house faced. In all compariso[illegible] made in this paper, the normal values are furnished by the series of observa[illegible]tions themselves.

Summary and Remarks for September.—The middle day is about 12h. 39m. in length from sunrise to sunset. The sun is on the equator on the 21st. The heat by *day* rises on a mean to 65°, and falls by *night* to 51°. The medium temperature is 58°, and the mean daily range 14°. The mean atmospheric pressure is 29·957 inches of mercury, and the prevalent wind W b S. Rain, to the amount of 2·35 inches, falls on 13 days. There are on an average 4 very fine days, 16 fine days, and the remaining 10 are overcast.

The maximum pressure was in 1865, with predominant northerly winds, the least amount and frequency of rain, and the finest weather; conditions which gave it also the highest temperature, 4° above the averages by day and by night.

The minimum pressure was in 1866, with persistent and strong WSW winds, the most overcast sky, and the greatest frequency of rain, which

measured nearly an inch above the average; conditions unfavourable for the full effect of the sun's rays, and the temperature by day was 2° below the mean.

The September which had the highest temperature, except 1865, was 1868. It was 3° above the average by day, and 2° by night, with pressure a little below the mean, deficient rainfall, very fine weather, and light variable winds chiefly from the NE.

The minimum temperature was in 1863, when the mean day and night readings were 4° below the average. Pressure was a little below the mean, westerly winds prevailed, the rainfall was abundant, the weather more than usually cloudy, with the greatest frequency of misty days.

September 1873 was also cold, by day and night 3° below the average; the pressure, winds, rainfall, and weather were seasonable, but there was great frequency of mist in the mornings.

The maximum amount of rain fell in 1871, with predominant NE winds, frequent overcast days, and pressure and temperature nearly at their mean values. September 1872 was similar to 1871, as regards pressure and temperature, but there were no easterly winds, and the rainfall was deficient in amount and the weather seasonable.

September 1861 appears to have had quite normal weather.

It may be worthy of remark, that in 1862, 1865, 1868, and 1871,—that is, every third year—northerly winds were predominant, and that they had high temperature, except 1871, which had the largest rainfall.

Summary and Remarks for October.—The middle day is 10h. 37m. in length. The sun is increasing his south declination. The mean of the greatest heat by *day* is 56°, and of cold by *night* 45°. The medium temperature is 51°, and the mean daily range 11°. There is a decrease of 7° from the temperature of September, while the range is less by 3°. The mean pressure at 9 a.m. is 29·898 inches, with prevalent WSW winds. The average rainfall is 2·78 inches on 16 days. There are on an average only two clear days, the rest are equally divided between cloudy and overcast. Mist now becomes more frequent, occurring on 6 days and fog on one day.

The maximum pressure was in 1866, with variable light winds, chiefly from E, the rainfall below the average, weather rather unusually misty and overcast, and temperature above the average.

The minimum pressure was in 1865, with variable winds chiefly from the N, and the maximum amount of rain, 6·29 inches, for part of which two thunderstorms may account; but on the whole the weather, judged by the sky, was fine, and the temperature was seasonable.

The maximum temperature was in 1861, 5° above the average by day, and 6° by night, with variable light winds chiefly from ESE, an unusual direction for monthly prevalence. The pressure was above the average, the weather cloudy and misty; rain fell on only 10 days (the amount was not measured).

The minimum temperature was in 1872, with prevalent WSW winds, the greatest frequency of rain, which amounted to 4·5 inches, two thunderstorms, overcast weather, and pressure below the average.

Results of Meteorological Obser

Year.	Barometer.	Temperature.			Rainfall.		
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.
	In.	°	°	°	In.		
1861	29·898	56·8	64·4	51·8	—	—	7
1862	30·046	58·8	64·5	54·2	1·70	12	5
1863	29·874	54·1	61·0	47·6	3·20	16	5
1864	29·956	56·1	64·9	49·2	2·42	12	8
1865	30·266	60·9	72·4	55·9	0·51	3	10
1866	29·747	56·6	62·7	51·7	3·27	24	2
1867	30·097	58·3	66·1	52·2	1·96	13	4
1868	29·873	59·8	68·5	53·5	1·90	10	7
1869	29·827	59·4	65·7	53·8	2·84	14	8
1870	30·082	54·7	64·0	49·6	1·76	9	5
1871	29·902	56·7	65·7	51·9	4·96	12	6
1872	29·890	57·4	66·2	50·6	1·39	14	6
1873	29·977	52·7	61·9	48·6	2·33	12	5
Means	29·957	57·1	65·2	51·6	2·35	13	6

Observations of Wind, referred to 16

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.	
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
1861	—	—	—	—	—	—	1	1·0	—	—	—	—	2	2·0	1	2·0
1862	—	—	5	3·4	3	4·3	1	5·0	1	2·0	1	3·0	1	2·0	1	2·0
1863	—	—	—	—	—	—	—	—	1	1·0	—	—	—	—	1	2·0
1864	—	—	—	—	—	—	2	2·5	1	1·0	—	—	—	—	—	—
1865	—	—	2	1·5	7	1·7	3	2·0	4	1·8	—	—	—	—	—	—
1866	1	2·0	—	—	1	1·0	—	—	1	2·0	2	1·0	—	—	—	—
1867	3	3·0	—	—	3	3·3	—	—	—	—	—	—	—	—	—	—
1868	1	2·0	—	—	3	4·3	1	3·0	12	1·5	—	—	—	—	—	—
1869	—	—	—	—	2	1·5	—	—	2	3·0	—	—	—	—	—	—
1870	1	2·0	2	1·5	3	1·0	1	2·0	7	1·4	—	—	—	—	—	—
1871	1	2·0	—	—	6	3·0	4	2·8	6	2·8	2	1·5	1	2·0	—	—
1872	1	2·0	—	—	—	—	—	—	—	—	—	—	—	—	1	3·0
1873	3	1·7	1	2·0	4	2·0	—	—	2	1·0	—	—	—	—	—	—
Means	0·8	2·2	0·8	2·5	2·5	2·2	1·0	2·5	2·8	1·8	0·4	1·6	0·3	2·0	0·3	2·2

rteen SEPTEMBERS at London.

ther at 9 a.m.				Notations of Day's Weather.					
	m.	f.	r.	b.	c.	o.	m.	f.	lt.
	2	2	4	1	19	10	1	—	—
	5	—	3	3	21	6	4	—	—
	4	—	5	2	19	9	7	—	2
	2	1	2	—	21	9	2	—	—
	6	—	—	21	9	—	2	—	1
	4	—	8	1	11	18	5	—	1
	—	—	3	—	17	13	—	—	2
	2	—	3	8	12	10	—	—	1
	1	—	3	2	20	8	—	—	3
	1	4	1	3	18	9	3	—	—
	1	—	3	3	9	18	—	—	—
	1	—	2	3	19	8	—	—	1
	6	—	—	3	16	11	2	—	—
	3	1	3	4	16	10	2	—	1

ean force (by Scale 0 to 12).

W.	SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms	Resultant.	
F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
2·0	4	3·8	4	3·0	2	2·0	3	5·0	6	1·8	2	5·5	1	W	1·7
5·0	4	3·0	1	2·0	5	2·2	—	—	—	—	2	1·5	2	N 25 E	0·2
3·0	4	4·0	4	3·2	2	2·0	5	2·6	6	3·7	1	3·0	1	S 84 W	1·9
—	4	4·5	8	3·4	13	3·3	1	3·0	—	—	—	—	1	S 75 W	2·7
—	3	3·3	—	—	4	2·5	1	5·0	1	2·0	1	1·0	1	N 17 W	0·3
2·5	8	5·3	3	4·7	4	3·2	1	8·0	2	5·0	—	—	2	S 64 W	2·5
—	5	3·8	6	4·0	7	2·4	—	—	4	3·0	1	3·0	—	N 86 W	1·8
—	5	5·0	1	1·0	5	1·4	—	—	—	—	—	—	—	N 22 E	0·4
2·5	8	3·5	5	5·0	8	4·6	1	4·0	—	—	—	—	—	S 67 W	2·8
—	2	5·0	4	6·0	7	3·3	—	—	1	1·0	—	—	1	S 73 W	1·3
—	—	—	1	2·0	4	2·0	2	2·0	1	1·0	1	6·0	—	N 52 E	1·2
—	4	3·3	3	3·0	12	2·2	5	3·2	2	2·0	—	—	—	S 82 W	2·0
1·0	5	2·8	3	2·7	7	3·1	1	1·0	—	—	1	2·0	1	W	1·1
2·7	4·3	3·9	3·3	3·7	6·2	2·8	1·5	3·4	1·8	2·7	0·7	3·2	0·8	S 79 W	1·3

Results of Meteorological Obser

Year.	Barometer.	Temperature.			Rainfall.		
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.
	In.	°	°	°	In.		
1861	29·898	56·8	64·4	51·8	—	—	7
1862	30·046	58·8	64·5	54·2	1·70	12	5
1863	29·874	54·1	61·0	47·6	3·20	16	5
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1865	30·266	60·9	72·4	55·9	0·51	3	10
1866	29·747	56·6	62·7	51·7	3·27	24	2
1867	30·097	58·3	66·1	52·2	1·96	13	4
1868	29·873	59·8	68·5	53·5	1·90	10	7
1869	29·827	59·4	65·7	53·8	2·84	14	8
1870	30·082	54·7	64·0	49·6	1·76	9	5
1871	29·902	56·7	65·7	51·9	4·96	12	6
1872	29·890	57·4	66·2	50·6	1·39	14	6
1873	29·977	52·7	61·9	48·6	2·33	12	5
Means	29·957	57·1	65·2	51·6	2·35	13	6

Observations of Wind, referred to 16

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.	
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
1861	—	—	—	—	—	—	1	1·0	—	—	—	—	2	2·0	1	2·0
1862	—	—	5	3·4	3	4·3	1	5·0	1	2·0	1	3·0	1	2·0	1	2·0
1863	—	—	—	—	—	—	—	—	1	1·0	—	—	—	—	1	2·0
1864	—	—	—	—	—	—	2	2·5	1	1·0	—	—	—	—	—	—
1865	—	—	2	1·5	7	1·7	3	2·0	4	1·8	—	—	—	—	—	—
1866	1	2·0	—	—	1	1·0	—	—	1	2·0	2	1·0	—	—	—	—
1867	3	3·0	—	—	3	3·3	—	—	—	—	—	—	—	—	—	—
1868	1	2·0	—	—	3	4·3	1	3·0	12	1·5	—	—	—	—	—	—
1869	—	—	—	—	2	1·5	—	—	2	3·0	—	—	—	—	—	—
1870	1	2·0	2	1·5	3	1·0	1	2·0	7	1·4	—	—	—	—	—	—
1871	1	2·0	—	—	6	3·0	4	2·8	6	2·8	2	1·5	1	2·0	—	—
1872	1	2·0	—	—	—	—	—	—	—	—	—	—	—	—	1	3·0
1873	3	1·7	1	2·0	4	2·0	—	—	2	1·0	—	—	—	—	—	—
Means	0·8	2·2	0·8	2·5	2·5	2·2	1·0	2·5	2·8	1·8	0·4	1·6	0·3	2·0	0·3	2·2

rteen OCTOBERS at London.

her at 9 a.m.				Notations of Day's Weather.					
	m.	f.	r.	b.	c.	o.	m.	f.	lt.
	4	7	4	—	17	14	5	2	2
	9	1	7	1	15	15	6	3	1
	7	1	4	1	9	21	10	1	—
	2	2	1	2	18	11	5	—	—
	3	2	9	6	9	16	3	—	2
	8	2	4	1	14	16	7	1	—
	3	—	2	3	10	18	6	—	—
	7	—	4	1	22	8	4	1	—
	5	1	3	6	12	13	1	1	—
	4	1	4	4	14	13	3	—	—
	8	2	2	4	10	17	8	—	—
	15	1	6	1	13	17	7	1	2
	9	4	3	—	15	16	17	2	—
	6	2	4	2	14	15	6	1	0·5

ean force (by Scale 0 to 12).

.	SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms.	Resultant.	
F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
·5	1	5·0	—	—	1	2·0	—	—	1	2·0	1	1·0	3	S 65° E	0 6
·5	10	5·0	2	5·0	3	4·0	1	3·0	2	2·5	1	1·0	—	S 47 W	2·4
·0	6	6·8	3	4·7	5	3·4	—	—	1	1·0	1	2·0	1	S 41 W	2·6
—	—	—	4	4·8	2	4·0	—	—	2	2·0	1	2·0	2	N 81 E	0·7
0	—	—	4	4·8	4	4·8	—	—	—	—	—	—	1	N 10 W	0·2
·0	—	—	2	2·5	2	1·5	—	—	1	3·0	—	—	3	N 79 E	0·4
·0	4	2·8	5	1·6	5	3·6	1	3·0	2	2·5	1	3·0	1	W	1·2
·0	7	2·3	1	3·0	14	2·4	—	—	—	—	—	—	—	S 87 W	1·2
·0	1	5·0	4	3·8	6	2·7	1	4·0	1	2·0	4	4·5	—	N 73 W	1·4
—	2	1·5	6	3·5	10	3·5	—	—	2	4·5	3	4·0	2	W	1·9
·0	3	2·3	3	2·7	9	2·7	—	—	—	—	—	—	6	S 79 W	0·9
—	5	3·0	3	3·3	4	2·0	1	2·0	1	4·0	—	—	4	S 66 W	1·0
—	3	1·3	6	3·2	7	2·6	—	—	1	3·0	—	—	6	S 82 W	1·1
5	3·2	3 7	3·3	3·5	5 5	3·0	0·3	3·0	1·1	2·7	0·9	3·2	2·2	S 72 W	0·8

Results of Meteorological Obs

Year.	Barometer.	Temperature.			Rainfall.		l
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.
	In.	°	°	°	In.		
1861	29·739	41·0	46·9	36·5	—	—	2
1862	29·966	40·7	44·7	36·2	1·12	10	1
1863	30·058	45·9	51·1	40·8	1·85	12	2
1864	29·811	41·7	48·1	35·8	2·38	12	—
1865	29·900	44·8	50·3	40·2	1·89	19	3
1866	29·968	45·3	51·3	39·7	1·49	16	4
1867	30·313	40·9	50·9	37·1	0·17	7	3
1868	30·023	42·0	47·0	38·4	0·93	10	4
1869	29·942	43·5	49·9	38·8	2·36	14	5
1870	29·814	40·9	46·7	37·3	1·82	15	2
1871	30·005	36·8	42·8	33·7	0·44	9	8
1872	29·710	44·9	50·2	41·4	3·06	21	1
1873	29·879	43·6	49·0	39·6	2·01	16	3
Means	29·933	42·5	48·4	38·1	1·63	13	3

Observations of Wind, referred to 16

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.	
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
1861	1	2·0	—	—	—	—	—	—	—	—	1	2·0	—	—	1	1·0
1862	8	2·3	2	2·0	5	1·8	—	—	—	—	2	1·5	2	1·0	—	—
1863	1	2·0	—	—	1	4·0	—	—	1	2·0	—	—	2	3·0	—	—
1864	1	2·0	1	3·0	4	3·5	1	4·0	3	2·7	—	—	—	—	—	—
1865	5	2·4	—	—	5	3·6	—	—	1	1·0	—	—	—	—	—	—
1866	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2·0
1867	6	2·5	3	2·0	2	1·5	1	5·0	1	7·0	—	—	—	—	—	—
1868	4	1·8	6	2·5	4	1·3	—	—	3	1·7	—		—	—	1	2·0
1869	2	3·0	1	4·0	—	—	—	—	—	—	—	—	—	—	—	—
1870	3	2·7	—	—	2	2·0	1	4·0	3	1·7	—	—	1	3·0	—	—
1871	1	2·0	1	1·0	5	2·8	3	2·7	3	4·0	—	—	2	3·0	—	—
1872	1	6·0	—	—	3	3·3	—	—	2	1·5	—	—	—	—	—	—
1873	—	—	2	2·5	9	2·0	1	3·0	2	4·0	1	3·0	—	—	1	1·0
Means	2·5	2·4	1·2	2·4	3·1	2·5	0·5	3·4	1·5	2·7	0·3	2·0	0·5	2·4	0·3	1·5

rteen Octobers at London.

her at 9 a.m.			Notations of Day's Weather.					
m.	f.	r.	b.	c.	o.	m.	f.	lt.
4	7	4	—	17	14	5	2	2
9	1	7	1	15	15	6	3	1
7	1	4	1	9	21	10	1	—
2	2	1	2	18	11	5	—	—
3	2	9	6	9	16	3	—	2
8	2	4	1	14	16	7	1	—
3	—	2	3	10	18	6	—	—
7	—	4	1	22	8	4	1	—
5	1	3	6	12	13	1	1	—
4	1	4	4	14	13	3	—	—
8	2	2	4	10	17	8	—	—
15	1	6	1	13	17	7	1	2
9	4	3	—	15	16	17	2	—
6	2	4	2	14	15	6	1	0·5

n force (by Scale 0 to 12).

SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms.	Resultant.	
o.	F.	o.	F.	o.	F.	o.	F.	o.	F.	o.	F.		Direction.	Force.
1	5·0	—	—	1	2·0	—	—	1	2·0	1	1·0	3	S 65° E	0 6
10	5·0	2	5 0	3	4 0	1	3·0	2	2·5	1	1·0	—	S 47 W	2·4
6	6·8	3	4·7	5	3·4	—	—	1	1·0	1	2·0	1	S 41 W	2·6
—	—	4	4·8	2	4·0	—	—	2	2·0	1	2·0	2	N 81 E	0·7
—	—	4	4·8	4	4·8	—	—	—	—	—	—	1	N 10 W	0·2
—	—	2	2·5	2	1·5	—	—	1	3·0	—	—	3	N 79 E	0·4
4	2·8	5	1·6	5	3·6	1	3·0	2	2·5	1	3·0	1	W	1·2
7	2·3	1	3·0	14	2·4	—	—	—	—	—	—	—	S 87 W	1·2
1	5·0	4	3·8	6	2·7	1	4·0	1	2·0	4	4·5	—	N 73 W	1·4
2	1·5	6	3·5	10	3·5	—	—	2	4·5	3	4·0	2	W	1·9
3	2·3	3	2·7	9	2·7	—	—	—	—	—	—	6	S 79 W	0·9
5	3·0	3	3·3	4	2·0	1	2·0	1	4·0	—	—	4	S 66 W	1·0
3	1·3	6	3·2	7	2·6	—	—	1	3·0	—	—	6	S 82 W	1·1
3·2	3 7	3·3	3·5	5 5	3·0	0·3	3·0	1·1	2·7	0·9	3·2	2·2	S 72 W	0·8

Results of Meteorological Obs

Year.	Barometer.	Temperature.			Rainfall.		]
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.
	In.	°	°	°	In.		
1861	29·739	41·0	46·9	36·5	—	—	2
1862	29·966	40·7	44·7	36·2	1·12	10	1
1863	30·058	45·9	51·1	40·8	1·85	12	2
1864	29·811	41·7	48·1	35·8	2·38	12	—
1865	29·900	44·8	50·3	40·2	1·89	19	3
1866	29·968	45·3	51·3	39·7	1·49	16	4
1867	30·313	40·9	50·9	37·1	0·17	7	3
1868	30·023	42·0	47·0	38·4	0·93	10	4
1869	29·942	43·5	49·9	38·8	2·36	14	5
1870	29·814	40·9	46·7	37·3	1·82	15	2
1871	30·005	36·8	42·8	33·7	0·44	9	8
1872	29·710	44·9	50·2	41·4	3·06	21	1
1873	29·879	43·6	49·0	39·6	2·01	16	3
Means	29·933	42·5	48·4	38·1	1·63	13	3

Observations of Wind, referred to 16

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.	
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
1861	1	2·0	—	—	—	—	—	—	—	—	1	2·0	—	—	1	1·0
1862	8	2·3	2	2·0	5	1·8	—	—	—	—	2	1·5	2	1·0	—	—
1863	1	2·0	—	—	1	4·0	—	—	1	2·0	—	—	2	3·0	—	—
1864	1	2·0	1	3·0	4	3·5	1	4·0	3	2·7	—	—	—	—	—	—
1865	5	2·4	—	—	5	3·6	—	—	1	1·0	—	—	—	—	—	—
1866	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2·0
1867	6	2·5	3	2·0	2	1·5	1	5·0	1	7·0	—	-	—	—	—	—
1868	4	1·8	6	2·5	4	1·3	—	—	3	1·7	—		—	—	1	2·0
1869	2	3·0	1	4·0	—	—	—	—	—	—	—	—	—	—	—	—
1870	3	2·7	—	—	2	2·0	1	4·0	3	1·7	—	—	1	3·0	—	—
1871	1	2·0	1	1·0	5	2·8	3	2·7	3	4·0	—	—	2	3·0	—	—
1872	1	6·0	—	—	3	3·3	—	—	2	1·5	—	—	—	—	—	—
1873	—	—	2	2·5	9	2·0	1	3·0	2	4·0	1	3·0	—	—	1	1·0
Means	2.5	2·4	1·2	2·4	3·1	2·5	0·5	3·4	1·5	2·7	0·3	2·0	0·5	2·4	0·3	1·5

...rteen Novembers at London.

...her at 9 a.m.			Notations of Day's Weather.					
m.	f.	r.	b.	c.	o.	m.	f.	lt.
8	8	7	—	17	13	10	1	1
12	10	2	—	11	19	14	10	—
6	1	3	1	15	14	5	—	—
7	3	1	—	13	17	6	1	—
4	4	4	1	11	18	5	2	—
4	2	3	2	12	16	7	2	—
2	5	1	—	9	21	6	2	—
4	—	2	4	9	17	8	1	—
5	2	1	3	11	16	3	2	—
10	3	2	3	6	21	7	5	—
9	4	1	5	10	15	6	3	—
11	1	3	1	9	20	11	—	—
7	1	1	3	13	14	10	—	—
7	3	2	2	11	17	8	2	—

...ean force (by Scale 0 to 12).

...W.	SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms.	Resultant.	
F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
2·0	5	4·8	7	3·1	2	1·5	4	2·5	4	2·5	2	2·0	—	S 66° W	1·9
—	1	5·0	—	—	2	1·5	2	3·5	2	3·5	—	—	4	N 12 W	1·0
2·3	5	3·0	3	2·7	8	2·9	—	—	—	—	1	3·0	—	S 54 W	1·5
3·7	3	5·0	4	3·8	1	3·0	2	2·5	1	2·0	—	—	3	S 47 W	0·7
4·0	8	6·1	—	—	4	2·0	3	2·3	2	1·5	—	—	—	S 74 W	1·4
—	2	4·5	8	2·8	11	2·9	3	4·3	3	4·0	—	—	2	W	2·6
1·0	—	—	1	4·0	5	2·4	3	1·3	1	2·0	1	2·0	3	N 14 W	0·9
—	—	—	—	—	6	4·8	—	—	1	3·0	—	—	1	NW	0·8
—	1	2·0	—	—	16	3·2	3	2·0	3	2·7	1	2·0	2	N 79 W	2·1
—	1	2·0	4	5·5	8	1·9	—	—	—	—	—	—	7	W	0·8
—	—	—	2	2·5	4	2·0	—	—	1	7·0	—	—	8	N 49 E	0·7
5·3	5	1·6	3	6·0	8	3·4	—	—	1	4·0	—	—	2	S 65 W	2·0
1·0	2	5·0	—	—	8	3·9	—	—	1	5·0	—	—	1	N 51 W	0·6
3·2	2·5	4·5	2·5	3·6	6·4	3·0	1·5	2·6	1·5	3·1	0·4	2·2	2·5	W	1·0

The temperature in 1873 was very low, with prevalent westerly winds, pressure and rainfall normal, but very hazy weather.

The minimum rainfall was in 1864, with variable winds, chiefly from E., normal pressure, temperature 4° below the average by day, but the weather otherwise seasonable.

Summary and Remarks for November.—The middle day has only 8h. 49m. The sun still continues to increase his south declination. The temperature by *day* rises to 48°, and sinks by *night* to 38°; the medium is 43°, and the mean daily range 10°. The temperature is less than that of October by 8°, but the range is only 1° less. The mean pressure at 9 a.m. is 29·983 inches with prevalent westerly winds. Rain falls on 18 days to the amount of 1·6 inches. On an average 2 days are very fine, 11 fine, and 17 overcast, fog occurring on 2. Thunderstorms are very rare.

The maximum pressure was in 1867 with northerly winds, temperature 2° above the average by day, 1° below by night, the least rainfall, and seasonable weather.

The minimum pressure was in 1872 with WSW winds, temperature above the average, maximum rainfall, and more overcast and hazy weather than usual.

The maximum temperature was in 1868, with pressure above the average, winds from SW, and seasonable weather.

The minimum temperature was in 1871, with prevalent calm and NE winds, pressure a little above the average, rainfall very deficient, and the maximum of fine weather.

Fog and mist were most prevalent in 1862, with northerly winds, mean pressure, temperature and rainfall below the average.

Summary and Remarks for Autumn.—In the summaries for the months I follow the plan of Luke Howard, in order that they may be compared with his, as given in his work on the *Climate of London*, 2nd edition, vol. i. pp. 258 *et seq.* It may also be useful to add a few remarks on the autumn generally. The medium temperature in this season declines from 58° to 43°; being on an average 51°, and ranging daily 12°. The mean atmospheric pressure at 9 a.m. is 29·98 inches, with predominant winds from W b S; rain to the amount of 6·63 inches falls on 42 days out of the 91 in the season. October is the wettest month in the year. September, occasionally a rather unpleasant month, is usually the most genial part of the year as regards the state of the sky. About the 21st October, the autumnal gales commence, and for the rest of the season squally and stormy weather is frequent. Snow occasionally, but rarely, falls in the latter part of the season, and mist and fog become more frequent. The mean values for pressure, rainfall, and weather, differ considerably from year to year; but it will be found that they are related in some measure to the prevalent winds. The frequency of the winds are N 7 days, NE 11, E 9, SE 3, S 8, SW 16, W 24, NW 7, calm 6 or polar 32, equatorial 53. On an average there are 8 very fine days, 4 fine, and 42 overcast. About 16 days are misty and 8 foggy.

DISCUSSION.

The President, in alluding to the interesting character of Mr. Strachan's paper, suggested that the author would find a very important subject for his investigation when he came, in due course, to deal with the spring season, which he hoped he would keep in mind. He alluded to the relative prevalence of the east wind at this season in different years, and the time of the year at which the cold east wind begins to blow in each season.

Mr. Budd said that, with reference to the notation for fogs, the letter *o*, or "overcast," was used, which usually denoted a sky covered with a canopy of cloud, whereas it was one of the characteristics of the dense London fogs that the sky was perfectly free from cloud. There was, however, another kind of fog with a cloudy sky, and he would suggest whether these kinds of fogs might not be distinguished.

Mr. Gaster said that the locality and the position of the instruments should be carefully described. The position and exposure of the thermometer stand are very important, and will cause more "local peculiarity" than even the kind of screen used.

Dr. Tripe said that he agreed with Mr. Gaster that a knowledge of the precise position of the instruments is absolutely necessary for making comparison with other observations taken at adjoining stations. Thus some time since he was engaged in comparing observations made at several stations in London, and found that several instruments had been placed so as to render the results useless. By making this remark he in no way reflected on Mr. Strachan, who would be sure to place his instruments in the best available position. He might just mention that the observations referred to showed that in the midst of London the air is drier, the mean maximum higher, and the mean minimum lower than in the outskirts, whilst the mean temperature for the year differs only in being less than one degree above the average.

Captain Toynbee remarked that he thought it would be well to record whether or not the sun could be seen through a fog; also that he had thought a good deal on the use of the letters *b* and *c* in Beaufort's notation of the weather, and would be glad to know from other meteorologists if they understood any more from their use than what they learnt from the figures which expressed the amount of cloud?

Mr. Strachan, in replying to the several speakers, said he believed there was no difficulty in distinguishing a London fog; but as to stating precisely the limit to a mist and the commencement of a fog, he could not. He agreed with Captain Toynbee that the amount of cloud was much the same information as the numbers of *c*, *b*, and *o*, and he had given a formula for so expressing these notations. He had not regularly observed the amount of cloud, and preferred the use of the letters because they represent three conditions instead of one, and conform to the popular designations of clear, fair, and overcast weathers. The position of the instruments would be described as suggested. He thought, however, that they could give him credit for knowing how to place thermometers to the best advantage, even though the circumstances were not favourable for very accurate observations.

XIII. *On the Climate of Patras, Greece.** By the Rev. H. A. Boys. Communicated by G. J. Symons, F.M.S.

[Received February 16th.—Read April 15th, 1874.]

There is, I think, no country in Europe combining so many varieties of climate in so small a space, and so ill provided with observers and means of observations, as Greece, the country of which I write. I believe that at the

* An abstract of this Paper has already appeared in the Report of the British Association for 1872. [Ed.]

present time Athens is the only place in Greece where a meteorological register is regularly kept. What was done by the English in the Ionian Islands during the occupation I cannot ascertain; and though there may be amateur observers like myself at work in other parts of the country, yet my impression is that, beyond those at Athens, very little is to be learnt from observations in other parts of Greece. And Athens is by no means a representative station for the country, being distinguished by a very exceptional climate, much more bracing and dry, much colder in winter and hotter in summer, than any other place at the same elevation in the whole kingdom.

Patras, the place in which I have been making observations for the last two years, is in many respects a complete contrast to Athens. I have had much difficulty in procuring proper positions for my instruments, which are not very numerous nor of the first quality. But I have contrived to keep an almost unbroken series of observations from the middle of October 1870 up to the present time (March 1872), giving the maximum shade temperature, the minimum shade temperature, the rainfall, and degree of humidity at a given hour (calculated by Glaisher's tables) for every day. To these, after the experience of one or two months in the country, I added daily notes of the direction and force of the wind, the amount of cloud, and the state of the barometer, with notices of the earthquakes that occurred, and general remarks. Before giving statistics, I must make some remarks on the position of Patras itself—position being every thing in a mountainous country like Greece. Patras lies on the NW coast of the Morea, on the very edge of the water, and on the SE side of the gulf which bears its name. This gulf, which is perhaps 20 miles long, has its entrance toward the west, about 7 miles wide, is about 12 miles wide in its broadest part, and narrows at its eastern end to scarcely more than a mile, beyond which it again opens out under the name of the Gulf of Corinth.

On the northern coast opposite to Patras are considerable mountains rising straight out of the water; on the southern side, but about 4 miles back from the coast, are other mountains, one of which, that nearest to Patras, is over 6,000 feet high, and has an important influence upon the climate of the town. Between this mountain and the shore are fertile plains devoted to the growth of the currant vine; but a low hill, a spur from the mountain just mentioned, runs down upon Patras, terminating abruptly so as just to leave room for the town between itself and the sea.

At the narrowest part of the gulf, sometimes called the Strait of Lepanto, the mountains on either side approach each other so nearly that they form as it were a huge funnel, up or down which, E or W, the wind must blow, as it does sometimes, with great violence. Patras, however, is out of the immediate line of this draught, though through this narrow passage we can see clearly the loftiest mountain range in Greece, viz. the Parnassidi,—from whose snowy tops the wind in the early spring sometimes blows very keenly,—otherwise we are open only toward the west; but even there the mountainous island of Cephallonia, though 60 miles distant, lies right across the W entrance of our gulf, and in that quarter also gives a horizon entirely of land.

The climate of Patras is naturally therefore mild and relaxing, seldom disagreeably dry, and not often very damp, being indeed drier by a great deal than any part of England.

Since the weather depends, it would appear, on the direction of the wind, the wind ought to be the first subject for consideration. In Greece, as I believe all over the Mediterranean, the winds are not called after the points of the compass from which they blow, as in England, but have proper names of their own, according to their quality rather than to their direction. Thus a wind which blows upon us from the west, may be either "mistrale" or "sirocco," according as it comes all fresh and invigorating from the NW, or laden with warm moisture from the SW; similarly a wind from the NE on Patras may be either a keen and clear wind from the veritable NE, or a hot, dry, sandy wind from the African deserts, which has got into the Gulf of Corinth, and must come out of it by the only practicable way. The direction of the wind is in fact so distorted in Greece among the mountains as to be no guide at all to its quality; rather we have to tell by the quality what was its original direction.

The names of winds most frequently used by the people of Patras, are "sirocco," "mistrale," and "gulf-wind" (for any wind which blows down the Gulf of Corinth), but they are far from consistent in their use of these. The ancient temple of Æolus, the god of the winds, an octagonal tower still standing in Athens, has sculptured on its eight sides the names and ideal forms of the eight winds into which the Athenian compass was divided. We, in Patras, are not so well provided, but perhaps six distinct qualities of wind might be made out and duly named.

First would come the gulf-wind from the NE. This in the early spring has much the same qualities as the same wind in England, excepting that it brings much finer weather. For 10 and sometimes 15 days together, it will blow strongly during the day time (dropping however at night), with a sharp, keen, dry air from the snowy peaks of the Parnassidi, bringing a wonderfully clear atmosphere, brilliant sunshine, very high barometer, maximum temperature varying from 45° to 55°, and minimum from 30° to 38° or 40°. The same wind will blow for a week in the summer, having the same accompaniments as before, excepting that it is then as hot as it was cold (bringing shade temperature up to 99°), and so dry as to cause even well-seasoned wood to warp, and the veneering on ordinary furniture to crack with a report like that of a pistol.

Another wind, not always easily distinguishable from this, attacks us occasionally from October till June. It proceeds from the deserts of Africa originally, but comes down on Patras from SE or E or even from NE. It is charged with impalpable sand to such an extent that the sun is obscured and a grey haze spread all over the sky, the distant objects on the horizon being at the same time quite clear. It is painfully hot and dry, and blows with tremendous violence, sweeping the dust from the roads until they look as if they had been washed clean by a heavy rain. Its usual duration is from to 4 days, during which time the temperature will rise to 77° even in the

month of March. This wind is called "sirocco," and is generally followe by rain.

A third SE wind, which seems purely local, comes sweeping down from th mountain before mentioned at night in brief but furious squalls.

Next comes the wind generally known as the "sirocco," a warm, damp rainy wind from the S and SW. This brings torrents of rain in October November and December, and showers until April.

Fifthly, we have the W wind, which divides with the gulf-wind the greate part of the year. Neither too hot nor too cold, neither too damp nor too dry this brings us the nice genial weather which makes the climate of Greece s lovely; if wanting at all, it is in freshness during the summer months.

Last comes the "mistrale" or NW wind, proceeding I believe from th Adriatic, whence it frequently blows in summer time after rainy weather there bringing freshness and vigour with it to the parched dry land around us.

Rainfall.—Patras, being in the Mediterranean, which is in the region o winter rains, has its rainfall very unequally distributed over the year. I would be very rash to attempt to calculate averages from an experience c less than two years; but that, though little, is enough to show how much th rainfall of Patras in western Greece differs from that at Athens on the easter side. I have known the weather to continue beautifully fine at Athens, whe at Patras for days together there were heavy rains; and also that the Athenia country has been flooded, while Patras enjoyed quite pleasant weathe Patras is no doubt of the two much the fairer sample of the country generall although the mountains in its neighbourhood draw off the storms very muc from the town. In considering the rainfall of Greece, it appears more con venient to divide the year between June and July than between December an January, by which division we should cut the rainy season in half. I believ the following rules will be found generally true for the sea coast, though the may not hold for the lofty mountainous interior of the country.

July will rarely give any rain at all. In August the weather will be slightl unsettled, and there will probably be a few light showers, and there may be heavy thunderstorm. September will give at least one thunderstorm. Durin the next four months there will certainly be frequent thunderstorm with heavy rain, and it is almost sure to be thoroughly wet fo two months together in this time; but whether these will come at th beginning, middle, or end of the four, is uncertain. There will be a spell o fine weather at some time in February and March while the gulf-wind blows after which, till near the end of April, there will be unsettled weather wit frequent light showers, and from then until July continued fine weather ma be expected, relieved rather than interrupted by a few short, though possibl severe, showers.

Even in the wettest months a long-continued drizzly rain is a rare occur rence; it comes generally in short but heavy showers, between which the su will shine brightly, and the roads, where good, dry up directly.

Temperature.—This is more easily observed than wind or rain, and appear to change so regularly, that calculations based on short experience are no

quite useless. The average temperatures for the different months in the year cannot differ much from those here set down:—

	Average Maximum Temperature.	Average Minimum Temperature.
	°	°
January	56	40
February	56	40
March	60	44
April	68	50
May	76	56
June	83	62
July	90	69
August	89	68
September	80	62
October	72	55
November	66	50
December	57	42

It is more difficult to guess at the extremes, but I may mention that the greatest maximum shade temperature during the year 1871 was 99°. This was in July with a "gulf-wind," and the greatest minimum night temperature was 74° at the same time. On the coldest day of the year the maximum shade temperature was 44°; it was a rainy day in December; whilst the lowest minimum night temperature was 30°, which occurred three times in February and March when the night was still and clear after a gulf-wind had blown all day.

The thermometers that gave these results were 20 feet from the ground, well exposed to the NE, but too much removed from the radiation of the sunshine from the ground by day, and from the influence of the dew at night.

Twice I have seen ice in the streets in the early morning when the thermometer had only shown 31°. But the winter frosts are quite inconsiderable, and geraniums live out of doors and continue to show a little flower all through the winter.

Snow falls but very rarely in Patras itself, once perhaps in five years, and I have seen none yet myself. It lies, however, sometimes for a good many days on mountains exceeding 3,000 feet in height; and upon Mount Voidhia, the mountain before alluded to, a few white patches may still be seen until about June 20th. Parnassus has still some left in August, and perhaps in a cold year it might never be all quite melted.

Clouds.—There is not much to say about these, unless I were to say a great deal. The movements of the clouds upon and among the mountains are very interesting to watch, but very difficult to describe. Some idea may be formed of the clearness of the Greek sky as compared with that of England from the following facts:—

In the year 1871 there were

29 days on which no clouds of any sort were seen.

113 days on which no clouds were seen excepting those which clung about the mountains; days, therefore, of uninterrupted sunshine.

182 days on which clouds were seen in the sky, most of which would be counted as decidedly fine days in England.

41 days on which the sky was entirely overclouded, so that no blue sky was seen all the day long. 35 of these were in January, February, November, and December.

I have a *hygrometer;* but not having with me in England any copy of the register of its readings, I cannot venture on any statistics, but the air is undoubtedly very much drier than that of England.

The extreme clearness of the atmosphere deserves attention. I have already said that the mountain in Cephallonia (5,300 feet), 60 miles distant, forms our western horizon. To see this is not an event, but an every-day occurrence; it must be seen from the sea-level at Patras at least half the days of the year. So also is the Parnassidi range (8,000 feet), distant perhaps 40 miles, which I have even discerned by moonlight when it was white with newly fallen snow. The nearer and lower mountains 10, 15, and 20 miles away, are distinctly visible by moonlight without the aid of snow.

Earthquakes, again, are interesting phenomena, for the observation of which Greece presents unfortunate facilities. These are frequently destructive at Delphi, along the shores of the Gulf of Corinth, at Zante, Cephallonia, and Leucadia. Patras was totally destroyed about 540 A.D., but since then it has only had slight shocks; but these occur very frequently, and are far from pleasant. Doors and windows rattle, walls and beams creak and strain, flakes of plaster fall, but I have not heard of any well-built house falling. From October 1870 to December 1871 inclusive, there took place 20 shocks, 6 of which were in December 1870. All of these were distinctly perceptible to myself, and there must have been many others unnoticed by me. January 1872 gave as many as 7, of which one was disagreeably violent; and another, though slight at Patras, threw down part of the convent of Mega Spelaion in the interior. Earthquakes are, so far as I can see, entirely unconnected with other meteorological conditions; and I have *not* noticed any fall of the barometer to accompany them.

The Aurora Borealis is a phenomenon not often witnessed in latitude 38°, but I have been so fortunate as to see two (October 25th, 1870, and February 4th, 1872), each of them more brilliant than any I ever saw in England. They were both of a deep red colour, but without the shooting rays. The first of them immediately followed an earthquake, and caused great alarm among the Greeks, most of whom had never seen one, and thought that a volcano had opened.

I subjoin tables of rainfall and of temperature.

TABLE I.—RAINFALL AT PATRAS.

	Months.	Total Fall.	Greatest Fall in 24 hours.	Date.	No. of days on which ·01 in. or more fell.	No. of days on which 1·00 in. or more fell.	No. of days on which ·50 in. or more fell.	
		In.	In.					
1870.	October	1·93	·66	11	7	—	2	
	November ..	1·73	·46	2, 9	6	—	—	
	December ..	7·97	1·41	22	22	2	6	
1871.	January ..	7·26	·96	2	18	—	7	
	February ..	2·05	·74	11	8	—	1	
	March	1·33	·44	23	7	—	—	
	April	·04	·02	2	3	—	—	
	May	·16	·08	28	3	—	—	
	June	1·00	·52	28	3	—	—	
	July	—	—	—	—	—	—	
	August ..	·17	·09	29	2	—	—	
	September	2·00	2·00	18	1	1	1	
	October	6·57	1·39	12	11	2	6	
	November ..	9 86	1·31	13	18	4	9	
	December ..	5·96	1·65	16	15	2	3	Total Fall for 1871......36·40 in.

TABLE II.—TEMPERATURE AT PATRAS.

	1870.		1871.											
	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Average Max. Temp.	68·3	60·3	57·1	56 3	61·7	71·	76·9	83·	90·7	89·8	82·3	73·1	65·2	54·7
Greatest Max. Temp.	75·	70·	64·	62·	76·	78·	88·	92·	99·	96·	88·	85·	73·	68·
Least Max. Temp. ..	58·	54·	49·	47·	49·	62·	70·	77·	83·	80·	77·	64·	58·	44·
Average Min. Temp.	49·	44·	40·2	40·6	44·2	51·3	56·8	63·4	69·5	68·7	64·1	57·3	51·4	41·7
Greatest Min. Temp.	59·	50·	49·	49·	58·	57·	69·5	67·	74·	72·	70·	70·5	59·	56·
Least Min. Temp....	40·	35·	32·	30·	30·	43·	47·	58·	64·	59·	58·	47·5	49·5	31·

DISCUSSION.

Mr. Scott said that he hoped Mr. Boys, when he expressed himself dissatisfied with his instruments, did not refer to a set which he had recently obtained from the Meteorological Office. He had examined Mr. Boys's registers, and these showed the great care of the observer; but some of the entries were of mere local importance, such *e.g.* as "snow on the mountains." The designations of the winds were not nearly so full as in Italy, where there were no less than 16 names, if not more, and the ordinary names according to the points of the compass were utterly disregarded. It struck him that earthquakes were more frequent at Patras than in Calabria; but he wished to record his protest against

the idea that earthquakes were in any way connected with meteorological phenomena. That view had been thoroughly exploded in the course of the last century.

Mr. STRACHAN said it was curious that at Patras the wind said to be called sirocco, was from the SW, and was moist, whereas in Italy the sirocco was a SSE wind, dry, hot, charged with sand-dust, and considered very discomforting.

Dr. TRIPE said that the thanks of the Society were due to Mr. Boys for his very interesting paper, especially as there are very few observations from Greece. The paper would be very valuable to medical men, as it will give them a good idea of the climate of Patras, and enable them to select the kind of cases which will be benefited by being sent there. The description of the effects produced by the excessive dryness of some of the winds, will necessitate considerable care in the selection of cases.

Captain VERNEY agreed with Dr. Tripe that the thanks of the Society were due to Mr. Boys. He (Captain Verney) was in Patras two years ago, and had the pleasure of knowing Mr. Boys. Mr. Boys had been in delicate health; he had gone to Greece on that account, and had derived great benefit from the climate. Those who feared the great dryness of Patras might be comforted by the reflection that it is the home of the vine, and that there is always at hand wherewithal to moisten the human clay. The meteorology of Patras is of vital importance to the inhabitants; their chief occupation is the growing and the drying of the currant grape; not only does the year's vintage depend on the weather, but a dry autumn is indispensable for preserving the crop after it has been gathered. Each vineyard has attached to it a drying ground whose floor is of smooth clay. Liquid manure is first poured on it to kill any animals that may have found refuge in the cracks; afterwards the currant grapes are spread on it to dry in the sun, an operation that lasts about 10 days; at night the grapes are gathered in under shelter. Sometimes a sudden shower of rain will wet the grapes before they can be protected, and then they lose their bloom; they may easily be dried again, but they are no longer of the first quality, and in a few minutes a peasant may see his hopes of a profitable year all gone. Some of the richer proprietors dry their currants on shallow wooden trays; at the first sign of a shower these are piled up one on the top of another, and a pent-house roof is placed on the top of all. When the currants are thoroughly dried, they are winnowed and sifted and packed for exportation.

Captain TOYNBEE thought that Mr. Boys was an able man, willing to work, which are the qualities so much needed in an observer; for it was evident that he would willingly carry out any suggestions as to future observations which the Society might wish to make to him.

Mr. SCOTT asked whether or not the character of the sirocco was different according as it was felt on a weather or lee shore, remarking, that in these islands, easterly winds were usually dry, but that the heaviest rain on the east coast came with east winds. Sea winds were always wet.

The PRESIDENT was under the impression that the sirocco varies very much in its character in different situations of the Mediterranean.

Captain VERNEY said that no first lieutenant ever thinks of painting in a sirocco, because it is well known that the paint never dries, and will have to be scraped off again.

Mr. SYMONS said that M. Bulard, in his work on the climate of Algiers, stated that the sirocco is a very dry wind in that country. With respect to the remarks of Mr. Scott, that Mr. Boys seemed dissatisfied with his instruments, he need only explain that the paper was written before the receipt of the instruments kindly lent by the Meteorological Committee.

Mr. LAUGHTON said that the sirocco is different in different places: at Algiers and along the north coast of Africa, it is a dry, burning wind; at Malta, it is clammy and damp; at Palermo, again, it is comparatively dry; and is moist, or even wet, on the coast of Italy. *Scirocco* is undoubtedly an Arabic word. Palgrave gives *Shelook* as another form of it.

Mr. STRACHAN said a great deal of information on the characteristics of the winds of Italy would be found in Scoresby-Jackson's *Medical Climatology*.

Mr. SYMONS mentioned that Admiral FitzRoy accounted for heavy falls of rain with an east wind, by saying that the vapour was supplied by an upper westerly current, and fell *through* the easterly, which as the heavier was on and near the earth's surface.

XIV. *Remarks on the Atlantic Hurricane of August* 20*th to* 24*th*, 1873. By W. R. Birt, F.R.A.S.

[Received March 10th.—Read April 15th, 1874.]

In the paper on this hurricane by Captain Toynbee, published in the 'Quarterly Journal of the Meteorological Society' for January 1874, pp. 15 to 28, it is stated that the data from the 'Cherub' and 'Sphinx' lead to the supposition that at noon of the 23rd the centre of the cyclone was about 150 miles to the SE of the position given to it by Mr. Macfarlane.

On the chart which accompanies Captain Toynbee's paper, the positions of these ships, their winds, &c. are not laid down, nor are these data for the 'Sphinx' given in the body of the paper. No. 2, page 18, contains the report of Lieutenant Baker, Commander of the 'Cherub,' and this gives the position of the 'Cherub' on August 23rd, latitude 34° 50′ N, longitude 68° 31′ W, with wind SE, shifting at noon to E by S. At 4.30 it backed to N by E. From these data it is clear that the ship was, as ascertained by Lieutenant Baker, in the left-hand semicircle of the storm, the centre having passed to the SE of her.

To the SE of the position of the 'Cherub' the track of the 'Plover' is laid down on the chart, and from Mr. Macfarlane's report the centre of the storm was SE of the ship on the 20th; but on the 23rd the centre was somewhere between the position of the 'Cherub' and that of the 'Plover,' this ship being in the right-hand semicircle. The reports from these ships are sufficient to fix, on the circular theory, the path of the hurricane between latitude 34° and 35° N, longitude 65° and 68° W, nearest the 'Cherub,' judging from her barometer, 28·93 in., at 3.30 of the 23rd.

Wind as reported from the 'Albemarle,' NE in the left-hand semicircle, and from the 'Louisa,' WSW and WNW in the right-hand semicircle, with the following heights of the barometer, 'Albemarle,' 29·80 in., 'Cherub,' 28·93 in., and 'Plover,' 29·83 in., are confirmatory of the circular character of this storm, so far as these ships are concerned.

The winds and barometer of the U.S.S. 'Wyoming' from noon of the 22nd to noon of the 23rd, are perfectly in accordance with the path of the centre as above assigned. Mr. Macfarlane has placed the track of the 'Wyoming' close to the centre or vortex, on account of the shifts of wind during the 24 hours. Her barometer, however, shows that she must have been steaming on the WSW margin, her readings being 29·98 in., 29·9 in., and 30·22 in. The 'Georgetta Lawrence,' during the two days from noon of the 21st to noon of the 23rd, made but little way. She appears to have sailed right into the vortex, with a rapidly falling barometer, crossing it on the afternoon of the 22nd; and it is not unlikely that the track of this vessel gives us a close approximation to the path of the storm in its locality, and also to the latitude of its recurvature. During the 21st she appears to have been in the advancing semicircle, approaching the axis line, barometer falling from 29·9 in. to 29·2 in. After crossing the vortex, she is in the right-hand

semicircle, the barometer having fallen to 28·7 in., the lowest reported These records of the 'Georgetta Lawrence' fix the position of the centre o the storm on the 22nd p.m. in or near 33°40′ N and 69°50′ W. At noon o the 21st, when the 'Georgetta Lawrence' had a NE wind and baromete 29·9 in., the 'Louisa' was very near the centre of the hurricane, in 28°0′ N and 65°20′ W.

The above data enable us to trace the course of the storm from 28° N 65° W, about noon of the 21st, to 34° N 70° W, on the afternoon of the 22nd. At this point the storm recurved, passing S of the position of the 'Cherub' on the 23rd, with a course directed towards the NE.

The point of recurvature of this storm is rather more northerly than usual. On September 8th, 1839, a hurricane, mentioned by Reid in his 'Progress of Development of the Law of Storms,' recurved in 35° N, 65° W, being more easterly and northerly than the one now under discussion, which may find a fitting place in class 6 of the hurricanes of the Northern Atlantic, Western Basin, 'Hand Book of the Law of Storms,' p. 47.

So far as the above data are concerned, there is nothing to suggest that the storm was *incurving*, as every position above-mentioned can be explained on the circular theory. The only winds recorded that do not appear to find a place as characteristic of this hurricane are those of the 'Wyoming' of the 23rd, requiring as they do the centre to bear NNW and NW of the ship When, however, she stood on an E course, the storm was moving away to the NE, so that these winds did not belong to the storm.

A barometric section of the storm from SW to NE, or thereabouts, is shown by the following readings :

'Wyoming,' 30·22 in. 'G. Lawrence,' 28·7 in. 'Cherub,' 28·93 in.

The gradient from the 'Wyoming' to the 'G. Lawrence' is very steep, 1·5 in. and that from the 'Plover' to the 'Cherub' is nearly as steep, 1·2 in. From these gradients it follows that the 'Georgetta Lawrence' and the 'Cherub' lay in a deep barometric depression, the margin of which was marked by high barometric readings.

In conclusion, I may take the opportunity of remarking that the paper o Captain Toynbee furnishes most important and valuable information fo prosecuting the study of cyclonology.

DISCUSSION.

Captain Toynbee.—I will first say that the Plate would have been improved by the addition of the 'Cherub's' and other data (readers may add them in pencil) but I wished Mr. Macfarlane's work to appear intact, so that I only remarked that the 'Cherub's' data, considered together with that of the 'Sphinx' (which ship was in company with H.M.S. 'Plover'), would place the centre of the cyclone to the SE of the position assigned it by Mr. Macfarlane. Mr. Birt comes to the same conclusion, and so far we agree.

But when Mr. Birt says, "so far as the above data are concerned, there is nothing to suggest that the storm was *incurving*, as every position above-mentioned can be explained on the circular theory," I *cannot* agree with him ; for he say that "on the 23rd the centre was somewhere between the 'Cherub' and 'Plover, but nearest to the 'Cherub,' judging by her barometer." Now the 'Cherub' was to the NW of the 'Plover,' so that if the centre was near the 'Cherub', *it* wa

also to the NW of the 'Plover,' and that ship's wind should have been SW, according to the circular theory, but it was SE, showing say 6 points of incurve.

Again, guided by the barometers of H.M.S. 'Cherub' and the 'Georgetta Lawrence,' the centre of the cyclone was most probably between them at noon of the 23rd; and I think Mr. Birt comes to the same conclusion. This position would place it about 220 miles S by E from the 'Albemarle,' which ship had a NE, instead of E by N, wind, as required by the circular theory, showing about 3 *points* of incurve. At the same time the 'Wyoming' was about 200 miles to the SW of the centre, and according to the circular theory ought to have had the wind NW, instead of which it was WSW, showing *six* points of incurving.

I have to thank Mr. Birt for bringing my attention once more to the subject, though the conclusion I come to is much the same as before, viz. that very much more good data is needed to enable us to work out the cyclone of August 1873 satisfactorily; but there is strong evidence that the wind does *incurve* in our West India cyclones, and that it may incurve at a greater angle on one than on another side of the centre. Mr. Meldrum's paper tends to the same conclusion for the southern hemisphere, so that I think meteorologists have no right to rest satisfied that the circular theory is a sufficient guide to the navigator.

I understand that General Myer, in America, and Mr. Rundell, in Liverpool, are both working at this gale. If their work is exhaustive, nothing more need be done; but if not, it may help towards carrying out a more complete investigation, as the Meteorological Office is still collecting the logs of ships that were in the North Atlantic during any part of August 1873.

Perhaps I may be allowed to call attention to one interesting fact which I omitted to remark on in my paper, viz. the *lull* in the wind which the 'Cherub' experienced, as the centre passed to the S of her. It seems to show that the gradient was less steep on the border of the calm, which probably existed at the centre of the storm, than at a greater distance from the centre.

Captain HULL said that if there is no decided fall of the barometer, you are not to assume that you are in a cyclone, although you may be in the neighbourhood of one.

Mr. BIRT, in reply, stated that, in connection with the question of incurvature, he had not determined the positions of the centre of the cyclone so closely as to bring out the slight amount of incurvature shown by Captain Toynbee's diagram; his object was rather to indicate the sweep of the path of the cyclone which, to him, appeared to be more in accordance with the ordinary paths than that shown by Mr. Macfarlane. In explanation of the statement in his paper relative to his inability to find evidence of incurvature, it had reference rather to the apparently exaggerated incurvature as shown in Mr. Meldrum's diagram than to the slight incurvature advocated by Mr. Clement Ley.

XV. *On the Meteorology of December in the southernmost part of the South Indian Ocean. Drawn up from information received at the Meteorological Office.** By ROBERT H. SCOTT, M.A., F.R.S.

THE meteorology of that part of the South Indian Ocean lying between latitude 45° and 53° S, and longitude 40° and 80° E, in which are the islands of Kerguelen, the Crozets, and Heard's (Mc Donald's) Island, has recently been discussed in the Meteorological Office with a view of deriving such information respecting the weather in this region in December as might be useful in connection with any expeditions which may be sent to these islands for observing the transit of Venus in 1874. As it will be many years before more complete data can be procured and prepared, it may be useful to make the present results available to meteorologists and geographers generally.

* This paper has been prepared by Mr. R. Strachan, F.M.S.

From the registers kept in this region during the month of December sets of observations were selected which would give the best daily mean values. They were generally six in number, though sometimes less. The day's observations were never divided, but all entered to the position of the ship at noon. The barometrical observations have been corrected for seal errors, for temperature, and reduced to sea-level. The temperatures have been corrected for any errors of thermometers exceeding half-a-degree. The specific gravity of the sea is given, corrected for errors of hydrometers and reduced to the standard temperature, 62° F. The directions of the wind have been corrected for variation of the compass.

The ships all sailed eastward through the region; those between 45° and 50° S averaged latitude 46° 40′ S, and those between 50° and 58° S averaged 51° 12′ S.

The years represented are the following:—

1855, 48 days; 1856, 6 days; 1857, 10 days; 1858, 6 days; 1859, 28 days; 1860, 4 days; 1861, 6 days; 1870, 10 days: so that the observations embrace 118 days altogether.

For one particular day there are observations from 4 ships; for two other days from 3 ships; and for twenty-two of the days from 2 ships.

The distances apart of the ships were too great for satisfactory synoptic comparisons of weather, but their observations indicate the law of wind in relation to barometric pressure. In applying this law for the purpose of foretelling the wind's direction or its changes in high southern latitudes, the fall of barometer due to change of latitude should be taken into consideration.

The average heights of the barometer show the decrease of pressure for increase of latitude; but there is also considerable difference in respect to longitude. The barometer ranges higher about longitude 50° to 70° E, than to the eastward or westward. The temperature of the air is there also slightly higher. Between latitude 45° and 50° S, from longitude 40° to 80° E, the temperature of the sea increases from 39° to 45°; but between latitude 50° and 58° S, in the same longitudes, the sea is remarkably uniform in temperature. The prevalent direction of the wind is NW or WNW, and the force is usually high. In latitudes 45° to 50° S, longitudes 40° to 80° E, December appears to have on an average 5 very fine days, 11 fine, and 15 overcast; fog or mist occurs on 8 days; rain, hail, or snow on 8 days; and squalls on 4 days. In the same longitudes, but between 50° and 58° S latitude, December averages 4 very fine days, 12 fine days, and 15 overcast; fog or mist occurs on 6 days; rain, hail, or snow on 10; squalls on 2 days. It is remarkable that with prevalent winds from NW and WNW, the swell of the sea should predominate from W and WSW.

The characters of the clouds, whenever noted, have been classified, and are as follows:

Lat. S.	Long. E.	Obs.	Cir.	Cir-c.	Cir-s.	Cum.	Cum-s.	Str.	Nim.
° °	° °								
40 to 45	40 to 45	18	—	5	1	7	3	—	2
"	45 to 50	37	1	7	10	9	3	2	5
"	50 to 55	28	5	5	3	4	1	5	5
"	55 to 60	33	—	6	—	7	5	2	13
"	60 to 65	38	1	2	1	13	7	—	14
"	65 to 70	62	5	8	—	15	8	9	17
"	70 to 75	29	3	3	3	10	5	2	3
"	75 to 80	35	5	—	—	7	7	1	15
50 to 52½	40 to 45	14	—	3	1	6	3	1	—
"	45 to 50	10	—	3	1	3	3	—	—
"	50 to 55	20	—	—	—	8	4	—	8
"	55 to 60	17	—	2	—	1	6	—	8
"	60 to 65	13	—	—	1	2	9	1	—
"	65 to 70	21	—	5	3	—	8	—	5
"	70 to 75	21	—	3	2	2	9	—	5
"	75 to 80	18	—	—	1	—	12	—	5
53	40 to 60	18	—	—	2	—	10	6	—

From this it seems that the cirrus cloud was not seen south of latitude 50° S; and the stratus very seldom. Under nimbus, the few entries of "cumulonus" (FitzRoy) have been included.

In order to compare the mean dynamical motion of the winds with the mean barometrical pressure of the air, the resultant direction and force of the winds have been computed. This has been done in two independent computations. First, from the directions and mean forces by the Beaufort scale, as given in the table annexed; and second, from the wind observations themselves, converting each estimated force into velocity in miles per hour, by the following table, which is an approximation to the various velocities corresponding to the several grades of Beaufort's scale, and has been drawn up from a consideration of the different estimates given by the several writers who have dealt with the subject.

Beaufort Scale.	Miles.	Beaufort Scale.	Miles.
0	2	7	42
1	5	8	50
2	10	9	60
3	15	10	70
4	20	11	80
5	27	12	90
6	35		

It will be seen from the results that the agreement is so close that practically it is a matter of indifference which method is adopted.

It also appears that the height of the barometer is related to the force of the wind; the resultant wind being stronger where the barometer is lower, and vice versâ.

METEOROLOGICAL DATA FOR DECEMBER. LAT. 45° to 55° S. LONG. 40° to 80° E.

Lat. S.	Long. E.	Barometer.		Temperature.						Sp. g. of Sea.		Notations of Weather.										Amount of Cloud.	Swell of the Sea noted from, on days.
		Mean.	No. of Obs	Air.	No. of Obs.	Evaporation.	No. of Obs.	Sea.	No. of Obs.	Mean.	No. of Obs.	No. of Obs.	b.	c.	o.	m.	f.	r. & h.	s.	q.	lt.		
° °	° °	In.		°		°		°															
45 to 50	40 to 45	29·386	26	39·3	26	38·1	21	39·0	22	1·0256	3	26	3	10	13	1	2	6	—	3	—	7·4	WSW 3, WbN 1.
„	45 to 50	29·391	38	41·3	38	40·3	33	38·8	25	1·0256	3	38	5	12	21	5	2	2	4	5	—	7·4	WSW 1, WbN 1.
„	50 to 55	29·609	39	41·9	39	41·5	34	38 7	26	1·0248	2	42	13	15	14	10	1	8	4	6	—	5·9	WSW 2, SSW 2, Confused 1.
„	55 to 60	29·590	33	43·9	32	43·3	26	40 8	25	1·0254	4	57	7	15	35	17	5	16	—	3	—	8·1	W 2, SSW 2, ENE 1, Confused 1.
„	60 to 65	29·538	44	45·8	44	44·6	39	42·9	37	1·0254	6	51	8	16	27	5	6	12	2	7	—	7·6	WbN 2, WSW 1, NE 1, Confused 1.
„	65 to 70	29·576	72	43·5	70	42·8	65	41·8	49	1·0254	5	80	9	29	42	15	16	17	5	8	—	7·8	WNW 2, WSW 2, NE 2, SSE 1, Conf. 2.
„	70 to 75	29·428	44	43·8	39	43·2	34	42·2	28	1·0255	3	47	10	19	18	3	9	14	2	10	—	6·9	WSW 2, WNW 1, Confused 2.
„	75 to 80	29·350	41	45·2	34	44·3	29	45·1	32	1·0244	6	45	6	25	14	2	5	16	3	11	—	7·4	WbN 3, SW 2, NNW 1, Confused 1.
50 to 52½	40 to 45	29·128	18	37·4	8	36·8	12	37·5	9	1·0265	1	18	4	12	2	6	—	—	5	2	—	6·4	WbN 1.
„	45 to 50	29 263	23	36·6	17	36·1	23	37·5	14	1·0250	4	23	2	6	15	7	—	5	4	2	—	8·4	WSW 1, NNW 1.
„	50 to 55	29·216	34	37·7	18	37·1	28	37·4	13	1·0256	5	34	4	13	17	2	—	7	8	4	1	7·7	WNW 1, WSW 1.
„	55 to 60	29·394	28	37·6	12	36·5	16	37·3	3	1·0264	3	28	5	14	9	2	1	—	13	4	—	7·1	WNW 1, WSW 1, NbE 1.
„	60 to 65	29·602	22	38·1	11	36·3	16	37·6	8	1·0262	3	20	7	7	6	3	—	—	2	—	—	6·2	WbN 2, WSW 2.
„	65 to 70	29·356	23	38·1	14	38 1	11	37·4	11	1·0255	3	23	4	10	9	2	2	4	6	1	—	6·9	NW 3, NE 1.
„	70 to 75	29·590	28	38·5	17	37·1	22	37·4	11	1·0267	3	28	3	10	15	7	1	3	3	2	—	7·5	WNW 2, WSW 2.
„	75 to 80	29·570	34	37·9	17	36·7	17	37·0	12	1·0255	5	34	—	10	24	4	5	7	3	—	—	8·8	WSW 2, NE 2, Confused 1.
52½ to 55	40 to 45	28·961	6	36·3	6	—	—	36·3	6	1·0241	1	6	—	—	6	3	2	4	—	—	—	8·5	WNW 1.
„	50 to 55	29·164	6	36·3	6	35·5	4	36·7	6	1·0240	1	6	—	5	1	—	—	—	1	—	—	7·0	NW 1.
„	55 to 60	29·436	6	37·6	6	35·9	6	36·7	6	1·0240	1	6	2	2	2	—	—	—	—	—	—	6·3	WNW 1.

... (BY SCALE 0 TO 12).

N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.		S.		SSW.		SW.		WSW.		W.		WNW.		NW.		NNW.		Calm.	Variables.		No. of Obs.	Resultants.				Lat. S.	Long. E.
O.*	F.*	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		O.	F.		Direction.	For the Scale 0 to 12	Direction	Miles per Hour.		
																																				°	Miles.	°		° °	° °
3	5·0	1	4·0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	4·0	2	6·0	9	5·8	6	5·0	2	6·5	2	5·0	...	...	...	26	N 69 W	4·3 = 22	N 71 W	25·8	45 to 50	40 to 45
3	6·0	2	8·0	2	2·5	...	...	...	...	...	...	...	...	...	...	1	8·0	3	6·7	1	9·0	2	6·5	7	5·6	7	5·3	4	5·8	6	5·0	...	...	...	38	N 64 W	3·7 = 18	N 67 W	20·6	"	45 to 50
3	5·0	1	5·0	4	6·3	2	7·0	...	...	...	...	...	...	...	...	...	...	1	4·0	1	9·0	2	5·0	11	4·7	9	4·5	4	5·2	4	5·2	...	...	...	42	N 51 W	3·0 = 15	N 52 W	16·6	"	50 to 55
8	5·9	6	6·2	2	5·0	2	5·5	1	5·0	1	5·0	...	...	1	9·0	3	7·0	2	4·0	4	4·8	5	5·4	8	4·9	6	5·0	4	6·0	4	6·8	...	...	...	57	N 48 W	2·2 = 11	N 48 W	12·6	"	55 to 60
10	6·0	3	5·3	2	7·0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	7·0	3	5·3	12	5·6	11	6·1	10	5·5	12	5·2	...	...	...	65	N 46 W	4·3 = 22	N 50 W	24·6	"	60 to 65
4	3·8	2	4·5	2	2·0	4	5·5	4	4·5	1	5·0	...	...	...	...	1	3·0	3	3·7	5	4·0	5	4·8	15	5·5	18	6·3	2	4·0	5	4·0	2	7	3·6	81	N 71 W	2·8 = 14	N 71 W	16·5	"	65 to 70
7	5·6	4	6·0	...	...	2	3·5	1	2·0	2	5·0	...	...	...	...	1	5·0	2	4·5	...	...	3	5·3	11	6·1	11	6·5	1	7·0	2	3·0	...	...	...	47	N 59 W	3·3 = 16	N 63 W	19·6	"	70 to 75
4	6·8	2	8·0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	4·0	16	6·4	10	7·8	5	5·8	5	8·0	...	1	4·0	45	N 59 W	5·6 = 32	N 60 W	30·9	"	75 to 80
3	5·7	3	5·7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	6·0	2	6·5	2	7·0	3	7·0	4	7·2	...	...	...	...	...	...	...	18	N 70 W	3·9 = 20	N 73 W	22·7	50 to 52½	40 to 45
10	6·3	2	6·0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	5·0	2	3·0	1	3·0	1	3·0	1	5·0	2	6·5	2	...	...	23	N 15 W	4·0 = 20	N 15 W	22·9	"	45 to 50
4	5·2	...	...	1	7·0	1	3·0	...	...	...	...	...	...	...	...	...	...	...	...	3	4·0	3	6·3	16	5·9	5	6·2	...	...	1	5·0	...	...	...	34	N 79 W	4·3 = 22	N 80 W	25·0	"	50 to 55
2	5·5	1	7·0	1	7·0	...	...	...	...	1	5·0	1	6·0	...	...	1	6·0	2	6·0	5	4·6	5	6·0	3	5·3	2	5·0	2	5·5	2	5·5	...	...	...	28	S 84 W	2·5 = 13	S 82 W	15·4	"	55 to 60
3	4·0	1	5·0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	5·0	4	4·5	6	6·2	5	6·4	2	5·0	...	...	...	22	N 53 W	4·6 = 24	N 54 W	26·1	"	60 to 65
1	7·0	3	7·3	...	...	...	...	...	...	...	...	...	...	...	...	1	5·0	1	6·0	2	5·5	2	5·0	2	5·0	5	6·2	3	6·3	3	5·7	...	...	...	23	N 56 W	3·6 = 18	N 57 W	22·6	"	65 to 70
1	6·0	2	6·0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	4·5	4	4·8	2	5·0	5	7·4	4	6·0	5	5·8	3	5·0	...	...	...	28	N 72 W	4·0 = 20	N 73 W	24·0	"	70 to 75
3	7·0	2	6·5	1	1·0	2	2·0	1	3·0	2	3·0	2	3·0	1	3·0	1	2·0	...	...	1	5·0	2	5·5	3	4·0	2	4·0	6	4·0	4	3·3	1	...	...	34	N 33 W	1·8 = 9	N 36 W	11·1	"	75 to 80
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	8·0	2	8·0	2	8·0	1	8·0	...	...	...	6	N 50 W	5·6 = 32	N 54 W	33·3	52½ to 55	40 to 45
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	7·0	3	6·7	2	6·0	...	...	...	6					"	50 to 55
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	4·0	1	4·0	2	3·5	2	8·0	...	...	...	6					"	55 to 60

OBSERVATIONS OF WIND DIRECTION, FROM MAURY'S PILOT CHARTS.

N. O.	N. F.	NNE. O.	NNE. F.	NE. O.	NE. F.	ENE. O.	ENE. F.	E. O.	E. F.	ESE. O.	ESE. F.	SE. O.	SE. F.	SSE. O.	SSE. F.	S. O.	S. F.	SSW. O.	SSW. F.	SW. O.	SW. F.	WSW. O.	WSW. F.	W. O.	W. F.	WNW. O.	WNW. F.	NW. O.	NW. F.	NNW. O.	NNW. F.	Calm.	Var. O.	Var. F.	No. of Obs.	Direction.	For the Scale 0 to 12	Direction	Miles per Hour.	Lat. S.	Long. E.
...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12	...	1	...	1	...	...	...	12	...	1	...	...	29	...	...	...	...	45 to 50	40 to 45
1	...	6	...	...	...	...	...	...	...	2	...	1	...	3	...	...	...	11	...	...	...	6	...	6	...	28	...	7	...	5	...	...	...	...	76	...	...	...	...	"	45 to 50
5	...	2	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20	...	3	...	18	...	...	...	...	49	...	...	...	...	"	50 to 55
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	3	...	3	...	...	...	...	9	...	...	...	...	"	55 to 60
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	3	...	4	...	...	...	...	...	...	8	...	...	...	...	"	60 to 65
...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	11	...	...	...	...	...	4	...	6	...	2	...	4	...	...	...	...	29	...	...	...	...	"	65 to 70

* The headings O. and F. are for "Number of Observations" and "Mean Force."

NOTES FROM THE OBSERVER'S REGISTERS.

Date.	S. Lat.	E. Long.	Remarks.
y. m. d.	° ′	° ′	
1855 12 21	48 20	43 30	Passed a large iceberg, afterwards a smaller several icebirds, and stormy petrels.
1859 12 5	46 10	44 25	Great numbers of birds; several patches of see
1855 12 11	49 30	49 0	Passed two small bergs.
„ 12 6	48 55	48 56	An iceberg about a mile in diameter.
1859 12 1	46 21	49 50	A large quantity of kelp; several seals and pen
„ 12 6	46 0	47 0	A large iceberg.
1855 12 23	48 30	54 0	A large iceberg, about 200 feet high, and about long. Several icebirds, Cape pigeons, petrel albatrosses; afterwards two large ice islands.
„ 12 13	48 14	50 50	Two large bergs.
„ 12 3	46 0	52 0	Water discoloured, a quantity of seaweed an birds.
„ 12 4	45 42	55 41	A quantity of seaweed and a number of icebird
1859 12 3	46 0	58 0	Water more greenish than usual; seaweed.
1858 12 27	45 30	58 50	A land bird; several icebirds; a few albatrosse
1859 12 29	45 11	55 8	Large quantities of seaweed.
1855 12 24	48 10	60 44	Water a lighter colour.
1859 12 4	45 46	63 31	A quantity of kelp.
1859 12 31	45 26	63 24	A little seaweed.
1858 12 30	45 18	68 27	Large quantities of seaweed.
1859 12 5	45 43	66 42	A quantity of penguins; shoal of porpoises southward; large quantities of seaweed.
„ 12 6	47 6	68 31	Shoal of porpoises going eastward; water greenish than usual.
„ 12 7	47 40	69 29	Plenty of albatrosses and penguins; four whale great many albatrosses.
1855 12 27	47 40	74 22	A small piece of ice.
„ 12 17	47 14	70 53	Water very much discoloured; a quantity of about.
„ 12 10	47 26	73 12	The water very much discoloured.
„ 12 11	48 30	72 0	Seaweed.
1861 12 9	45 54	76 26	A few birds.
1855 12 18	47 17	76 21	Water discoloured; a few birds.
„ 12 12	48 30	77 31	Some seaweed.
1859 12 11	46 12	76 0	Several patches of seaweed.
1855 12 24	51 0	41 0	Four icebergs.
1856 12 15	51 0	45 0	An iceberg about 200 feet high; also a piece of ice.
1855 12 25	51 0	46 0	A large iceberg and a quantity of small pieces.
1856 12 16	51 12	51 8	A few petrels.
1855 12 13	50 30	59 0	A large iceberg, distant four miles, water 36°, wards rose to 39°.
1856 12 18	51 38	62 20	Sperm whale.
1855 12 29	51 40	62 45	Two icebergs and four large pieces, each piece half the size of the ship; the sea breaking them.
1857 12 15	50 20	68 8	A number of petrels.
1855 12 30	51 40	68 0	Sea high; height of waves 30 feet, distance bet each 170 feet, rate about 1½ knots; sea quite g

NOTES FROM THE OBSERVER'S REGISTERS.

Date.	S. Lat.	E. Long.	Remarks.
y. m. d.	° ′	° ′	
1855 12 15	50 4	72 4	Water greenish.
,, 12 31	51 30	73 50	Sea quite green.
1856 12 19	51 38	70 16	Water discoloured a little. A few snow birds, Cape pigeons and sooty albatrosses.
1857 12 16	50 15	73 43	Sea mud-like colour.
,, 12 17	50 55	75 35	Water a dull green; a number of seabirds.
,, 12 18	50 47	77 10	Two whales, sea dark blue.
,, 12 19	50 59	77 52	A flock of sea ducks.
1856 12 20	51 38	77 24	Water much discoloured; examined some of it with a microscope; some few animalculæ, but not enough to colour the water. Birds about, particularly *diomedea familiaris* (*sic*) and Cape pigeons.
1857 12 17	50 50	76 20	At midnight, aurora in SE, spreading its rays sometimes as high as the zenith.
1870 12 26	53 0	56 0	A small iceberg.

XVI.—*On the Diurnal Variations of the Barometer.* By JOHN KNOX LAUGHTON, M.A., F.R.A.S.

[Received March 11th.—Read April 15th, 1874.]

It is familiarly known to meteorologists that, within the tropics, the barometer shows diurnal maxima and minima with almost unfailing regularity. Later and more extended observation has only confirmed the broad statements made many years ago by Baron Humboldt in South America, and by Colonel Sykes in India; so that we may accept the phenomena spoken of as a well-established fact; and though the greater fluctuations and changes of the barometer in higher latitudes, and the very frequent passages of centres of low or high pressure, with their atmospheric disturbances, quite prevent our being able to trace the small diurnal variations in anything like a complete set of observations,—since, indeed, they are not shown by the barometer,—it would still appear that there is a tendency towards their formation, which we may fairly believe to be continuous.

As an instance of this, I here give the mean barometric pressure of July, through the 24 hours, for five years, 1856-60, at Barnaoul, abstracted from the 'Annales de l'Observatoire Physique Central de Russie':—

HOURS......	O.	I.	II.	III.	IV.	V.	VI.	VII.
Barometer .. (in demi-tenths) 583+	1·192	1·134	1·074	1·026	·988	·979	1·004	1·064
HOURS......	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	XV.
Barometer .. 583+	1·130	1·152	1·180	1·200	1·188	1·178	1·136	1·122

Hours......	XVI.	XVII.	XVIII.	XIX.	XX.	XXI.	XXII.	XXIII.
Barometer .. 583+	1·142	1·174	1·246	1·298	1·322	1·364	1·362	1·374

My present object, however, is not to discuss the grounds of this bel but, taking as a basis the fact, of which we are well assured, that in tro countries, and under favourable circumstances, in extra-tropical countries the barometer is found to attain maxima and minima values at certain h with very persistent regularity,—to endeavour to deduce from this a perfect understanding of the connection between wind, temperature, humi and barometric pressure.

As a general summary of the observed facts, sufficiently accurate for present purpose, I may say:—

The barometer shows maxima readings at about 10 a.m. and p.m., minima readings at about 4 a.m. and p.m.

The a.m. maximum is more marked than the p.m.

The p.m. minimum is more marked than the a.m.

Or, which is the same thing, the maxima and minima by day are *both* marked than those by night.

In considering the times at which these maxima and minima occur, w once notice that those of the minima, about four o'clock, afternoon morning, are, respectively, very nearly the hottest and coldest parts of day: the minima, therefore, cannot *both* be attributed to the absolute tem ature at either time; for if, according to a very widely held doctrine column of hot and expanded air, such as we have about four o'clock in afternoon, must weigh less than the mean, and so give a minimum read on the other hand, the superincumbent column of cold dense air, about o'clock in the morning, must weigh more, and so give a maximum.

The fact also that the maxima occur at the times of the day when the perature is about the mean; when, therefore, the weight of the superimp column, and (according to the theory I have just referred to) the barom reading, should be about the mean,—seems to render untenable any idea tha maxima and minima are due to the absolute temperatures: whilst consideration that the maxima, though occurring at the period of gre change in the temperature, or about half-way between the thermometric ma and minima, make little distinction as to the direction of that change, further complicates the question.

It has consequently been maintained that it is to the varying tensio aqueous vapour at different hours of the day, that we must look for an e nation of these phenomena; that, for instance, the morning minimu caused by the withdrawal from the air, by condensation, of a great part o vapour, which has a very considerable tension in tropical countries, especially in the neighbourhood of the sea, to which our observation chiefly restricted. To this it might be objected that the vapour withdra

replaced by air, which is heavier, thus increasing the weight of the column; or that if the condensation by night tended to cause a minimum at the coldest part of the night, so the free evaporation going on by day should tend to cause a maximum, or at least an increased reading, at the hottest part of the day. Without overwhelming proof, it can scarcely be admitted that such very opposite causes as a maximum condensation and a maximum evaporation produce exactly the same effect on the barometric reading.

The circumstances of the maxima, however, seem to offer a still stronger objection to this manner of considering the subject; for the hours at which these recur, are the hours at which not only the temperature, but also the quantity and tension of vapour, are very nearly at the mean, and are, at the respective hours, changing in opposite directions; and there is certainly no self-evident reason why a mean tension of vapour present in a column of air at the mean expansion should cause a higher reading of the barometer than *both* a maximum tension in a column at a maximum expansion and a minimum tension in a column at a minimum expansion.

But the principle of considering the barometric pressure, at one place, on one day, as composed of two pressures,—that of the dry air and that of the vapour,—seems to me altogether unsound and inadmissible. The investigations of Dove, some years ago, gave a prestige to the method of resolving the pressure into these components; so that it has been adopted unthinkingly in cases to which it is quite inapplicable. Dove's introduction of the method was principally, if not entirely, with the view of comparing the barometric pressure at different places, at different seasons; and when applied to only one place, referred to the annual variations, to changes, that is, extending over a long period, through which the effect of the prevailing winds would, in the average of a great number of years, be practically a constant. Or again, in comparing the contemporaneous changes in the pressure of air in two different but adjacent districts, the difference in the change of the several components of the air may and must be taken into consideration: and thus not only the introduction or withdrawal of vapour is a point to be dwelt on,—since in the different places the change may be going on in opposite directions,—but also the difference which exists between the co-efficients of expansion of vapour and dry air has to be taken into account, as giving increased importance to differences of temperature.

In a paper which I had the honour of reading before this Society last May, I referred to these differences as bearing directly on the phenomena known as "Land and Sea Breezes;" but when our consideration is more especially turned to the atmospheric circumstances of one locality on one day, it seems to me that the components of the pressure do not properly enter into the question: to all intents and purposes, the pressure is one, the air is one: as one, the air expands or contracts; as one, the pressure increases or decreases; if over the land, the quantity of vapour experiences no very great increase from evaporation; any increase there may be, is blown in from other regions, more especially from the sea, and is therefore necessarily dependent on the direction of the wind, the neighbourhood of the sea, and the many changing

and uncertain influences which may be acting, in other regions, to augment or diminish evaporation.

It has, again, been argued that the quantity of vapour in the air near the surface of the earth is probably greatest about ten o'clock in the forenoon, when it is rapidly forming and has not yet had time to disperse. But actual observation at once negatives this view. According to Colonel Sykes, at Bombay, in March, the weight of moisture in a cubic foot of air was 7·927 grains, giving a relative humidity of 68·55 between 9 and 10 a.m.: whilst between 4 and 5 p.m., these numbers had risen respectively to 10·497 and 77.71. [Phil. Trans. vol. 125, p. 210.] Much of this increase of vapour is probably blown in by the sea breeze; but this would only confirm what I have just said as to the impropriety of considering separately the components of the pressure, in reference to the diurnal variations in one locality.

A part at least of the confusion and difficulty which surround this problem seems to me due to the habit meteorologists have got into of considering the barometric pressure simply as a function of the weight of the super-imposed column of air. If that column is throughout in equilibrium, there is no doubt that the elastic force of its lowermost part is properly and exactly represented by its weight: but this is not the case when disturbing agencies are at work, forcing the column out of equilibrium. We know, experimentally, that if a quantity of air be confined, as in a bladder, its elastic force increases with increase of temperature, until it attains sufficient strength to burst the confining envelope: and by a simple adaptation of glass vessels, from one of which the air, whose elastic force has been increased, is allowed to rush into the other, it is easily shown that its inertia carries it on past the point of equilibrium of elastic forces; so that where the pressure was highest, it becomes lowest; and that this change of high and low pressures goes on for two or three alternations, or more, according to the difference primarily imparted. This is, in fact, a mere modification of Daniell's well-known experiment.

The immediate action of this recuperative or resilient power in the elasticity of the atmosphere, is curiously illustrated in a notice of the heavy rainfall at Durban on 4th March, 1873, communicated to us last June by our President (Dr. Mann).

On March 3rd, at 9 a.m., the barometer stood at 29·934 in.

„ 5th, „ „ 30·214 in.

During the night 4th-5th, the rainfall was 6·5 inches.

We have here an instance, not by any means singular, of one great difficulty which lies in the way of all attempts at theoretical investigation of meteorological phenomena; of the apparent contradiction which these offer to theoretical reasoning. We may, I think, fairly assume that the sudden abstraction from the air in the neighbourhood of Durban of vapour sufficient to give 6½ inches of rain within a few hours *must* have reduced the elastic force of that air; yet, according to the barometric reading, the elastic force was increased. I think the apparent contradiction may be explained by reference to the recuperative power of which I have spoken. That a

diminished elasticity accompanies such a rainfall must be conceded: into the comparative vacuum so formed, the adjacent air immediately enters; and the momentum of the air once in motion, causes an excess to enter into the given space, thus compressing the air, increasing its elastic force, and raising the barometer.

The question then fairly arises whether we have not, in the experiments and observations to which I have referred, a state of things somewhat analogous to the conditions under which the diurnal maxima and mimima so regularly recur—whether, in fact, the forenoon maximum may not be due to the increase of elastic force in the lower body of air consequent on the rapid and increasingly rapid heating from the surface of the earth, before it has gained sufficient strength to overcome the inertia of the air at rest, above or around, and so to enlarge its volume: whether the afternoon minimum may not be due to the inertia of the air in motion, which carries it away from the place of observation, in excess of what was required, as well as to the diminishing rate of change in temperature: and similarly, whether the nocturnal maximum and minimum may not be caused by alternate influx and efflux, assisted, perhaps, by other agencies. It is this question which I propose now to consider.

The irregularities of the surface, and the different capacities for heat in the soil of adjacent places, much as they must modify the effect produced on the air, are accidents, not essentials, of the problem: we may, therefore, for the present, neglect them, and suppose that the temperature of the surface, and of the air immediately resting on it, rises continuously from daybreak, or somewhat before it, till between 2 and 3 in the afternoon.

Let W L E denote three patches of the earth's surface, on the same parallel of latitude, contiguous to each other, and sufficiently large to allow a sensible difference in local time: and suppose L, the middle one of the three, to be, especially, the place of observation.

W′ W L E E′

At the coldest part of the night, the air over L is contracted to its extreme limit, and other air is flowing in, to fill the void which the contraction would otherwise occasion. That it does not flow in quite contemporaneously with the contraction seems pointed out by the minimum of early morning; and if we may admit this, it would appear that the subsequent influx not only gives weight and additional pressure to the column, but gives the whole mass a certain downward motion, which, slight as it may be, resists the upward tendency which begins to be excited in the lower strata by the heat communicated by the earliest rays of the sun. But at this same time, the air over E, which has felt the influence of the sun still earlier, has begun to overcome the inertia of the air around it, and is enlarging its volume towards the west, thus driving air towards L. It does not drive the air eastwards, towards E′; for there the sun, having still more power, has caused a still greater elasticity in the air, which is therefore expanding with still greater force: nor to the north, nor to the south; for the conditions there are locally the same as at E: the west is the place of least resistance, and in that direction the escape

takes place, gently at first, but gradually increasing in volume and velocity. Through some sensible time after sunrise at L, we have then these conditions :—

An influx of air in the upper strata of the atmospheric column, giving increased weight and increased pressure:

A downward motion of the upper part of the column:

An increase of elastic force in the lower part of the column, due to the increasing temperature:

An influx of air from the eastward, gentle, but gradually increasing.

The united effect of these conditions must be an increase in the barometric pressure at L, which will continue until—

The influx above comes to an end:

The downward motion is checked:

The air in the lower part of the column, having overcome the downward motion above, and the inertia of the air lying towards the west, begins to escape in proportion to the increase of temperature:

The influx from the east no longer increases, and begins to decrease.

Now, if all these conditions happened at one time, that would be the time of maximum pressure; in estimating which, it should be borne in mind that the barometer is but a sluggish instrument, and that time is required to overcome the inertia of the column of mercury: the indications of a change in pressure are thus not sensible till some time after the change has actually taken place.

It is quite impossible to attempt any numerical estimate of the time during which the influx above continues: but as the gradients down which it runs are extremely fine, the motion must be extremely slow, becoming slower and slower as it draws to an end. The reversion of the downward motion must in great part depend on the augmented elasticity of the air below: which again depends on the proportionate increase of temperature and expansion. The rate at which the temperature increases is therefore an important consideration; for so long as this rate is increasing, so long is there an increasing increment to the pressure which is accumulating to produce motion in the surrounding mass of inert air. But when the inertia of repose has been overcome, when the mass of surrounding air has a certain momentum, when the air at L no longer receives an increasing but a decreasing increment of temperature, when therefore the increment of its expansive tendency is becoming less, the accumulation of pressure stops, the elastic force ceases to increase. This is the time of the forenoon maximum.

When the increment of temperature and expansive tendency is no longer an increasing quantity, and when the surrounding air (its inertia of rest being overcome) is being driven outwards, the pressure at L begins to decrease; the temperature and expansive tendency, however, still increase, and continue to drive the air outwards with increasing velocity, and thus first check the light wind which has been blowing in from the east, and afterwards drive it back, causing later in the day, when the expansive tendency is at its maximum, a reverse, or light westerly wind to be felt at E or E′. Now the

air being forced away from L, towards the west, towards the east, and upwards, acquires a certain momentum; it gets way on it, and does not lose it for some time after the force, which gave rise to it, has ceased to act. The maximum temperature is about 2 p.m.; after which the expansive tendency decreases, and the outward thrust ceases: the outward motion, however, still continues, gradually becoming less; and at the moment when it stops, we have the conditions:—

The air has moved away in excess of what corresponds to the existing elastic force:

The elastic force is itself diminishing.

It is about this time that the barometer shows its minimum afternoon reading.

As soon as the outward motion has come to an end, the reverse or inward motion commences: this is principally from the place where the outward motion similar to that we have just spoken of is going on, that is from W and W′, giving rise to a gentle and increasing breeze from the west: the superincumbent column also begins to press downwards into the place L, where the elasticity of the air has been diminished, and where the temperature is falling. This influx of air will increase the barometric pressure; and the air, once in motion, will, by reason of its "way" or inertia of motion, continue to flow in, even after the comparative vacuum, which primarily gave rise to the influx, has been filled. When this motion comes to an end is the time of the evening maximum. And the reverse motion which immediately follows it, accompanied by a decrease of temperature, in exactly the same way, occasions the minimum of early morning.

From what I have said, it will appear that if the theory of these diurnal variations, which I have proposed, be correct, we should find a distinct tendency towards easterly winds in the morning, that is, whilst the barometric reading is approaching its forenoon maximum; and a corresponding tendency to westerly winds in the evening, whilst the barometer is approaching its evening maximum. Here, then, observation ought to step in: but I am sorry to have to say that published observations which fairly bear on the question are extremely scarce. There is, however, a certain amount of collateral evidence, which I will briefly state.

It is fully recognised by our seafaring population all along the south coast, that in fine summer weather, the wind is easterly in the morning, and goes round, through south, to westerly in the evening. The truth of this was brought home to myself in a very practical manner during two summers that I spent at Milford, on the coast of Hampshire; for the west wind, however slight, brought in a surf that made bathing from the beach unpleasant and even difficult, whilst with an easterly wind, the sea was as smooth as a mill-pond. I bathed every morning at 7 o'clock, and almost always in a smooth sea; whereas in the evening the sea was generally breaking heavily. A notable instance of this is recorded in the history of one of our battles with the Spanish Armada: it would be out of place here to go into the details of this battle; I will therefore merely refer to Froude, or, which is still better, to Ledyard, or Hakluyt.

The same thing is distinctly marked on the south coast of France, and especially in the roadstead of Hyères: this is the account given by Admiral Bourgois, of the French Navy [Revue Maritime et Coloniale, vol. xviii. p. 417.]:

"The roadstead of Hyères is bounded on the north by the coast of Provence, running in an ENE direction, and on the south, by a chain of islands low enough to allow the breeze from the sea to pass over without difficulty. During the fine days of spring and summer, when there is no great atmospheric current, there is very often in the morning a light breeze from the east, which turns with the sun towards the south, gradually getting fresher; and dies out in the west about sunset. The same phenomenon is observed also, under similar circumstances, in the roadstead of Toulon, but less frequently, on account of the sea breeze being stopped by the peninsula of Saint Mandrier."

It is then to be asked whether these distinct diurnal changes are the mere alternations of land and sea breezes. It has been very commonly assumed that they are. Admiral Bourgois is sure of it; and explains the rotation of the wind by reference to the theory expounded by Dove, in respect to his Law of Gyration. Now I have no doubt whatever about the general truth of the Law of Gyration: but I have very great doubt as to the correctness of Dove's theory; consequently, I cannot accept a reference to it as an explanation of this or any other phenomenon. But even if I was fully prepared to accept Dove's theory, Bourgois' application of it is inadmissible; for the sea breeze ought, in its beginning at any rate, to blow at right angles to the land, that is from the south; from which direction it should (according to Dove) gradually draw round to the westward: but there is certainly nothing in Dove's theory which can explain the sea breeze, whatever may be its cause, beginning parallel to the coast, from the east.

The presence of land and sea breezes does, however, undoubtedly complicate the question; the more so, as the changes on the north coast of Africa seemed markedly different. I have wished, therefore, to eliminate these by the consideration of diurnal changes at stations,—

Where a high temperature might render the effects I have described sufficiently sensible; if, indeed, they exist:

Remote from the sea, and from the influence of land and sea breezes:

Remote from mountains, and free from forced currents of air:

Where the prevailing wind is not so strong as to swamp any tendency to regular diurnal variation.

Well, I have sought for these stations; but have not found them in sufficient numbers. I open the map, and lay my finger on Murzuk. There is the place: if I could only get a long series of observations from it, it would almost settle the question. But there are absolutely no observations at all; which is the more provoking, as many travellers and so-called scientific expeditions have stayed there for weeks or months. Lahore, Delhi, half a hundred places in India might be named, returns from which during the hot months preceding the commencement of the south-west monsoon

would be of very great value. There are none to be had. From the Western States of the Union, from Kansas, Missouri, or Kentucky; from stations such as Forts Leavenworth, Gibson, or Kearney, the observations are published only in abstract. I understand they are preserved at Washington in MS. If these remarks should be fortunate enough to attract the notice of any of our American fellow-workers, perhaps some of them may be induced to examine into the returns from stations such as those I have named.

The Russian stations alone remained, and from these the published observations are very full: but of those which are given in complete detail, Barnaoul is the only one that satisfies the conditions I have enumerated; the only one, therefore, with regard to which I was altogether unfettered. I found that for the five years 1856-60, the barometric maxima in July were at 11 a.m. and 11 p.m. [see *ante*, table on p. 155.] I took therefore the observations of wind for two hours before the maxima, that is for 9 a.m. and 9 p.m. For the other stations I had to content myself with the hours of observation given, which are for the most part 7 a m. and 9 p.m.

I have included also the observations from the State of New York, which have lately been published by authority: but it is necessary to point out that these stations do not fully satisfy the conditions I have laid down; some of them are near the sea; some are close to the lakes; possibly some are by no means clear of local influences: as, however, the sea is to the east and the lakes to the west, the disturbances arising from these should produce opposite effects, and should counterbalance each other. Such as they are, I have therefore taken them collectively in the first instance; and have afterwards selected those which, so far as the map shows, are the best suited for my purpose, midway between sea and lake.

The subjoined table is an abstract of these observations for the month of July. It is constructed as follows:—

All winds having easting or westing were included as easterly or westerly; and the sums of these, at the a.m and p.m. observations, reduced to the ratio recorded. I have then further compared these ratios in a compound ratio, thus:

$$\frac{A}{B} = \frac{\dfrac{\text{number of easterly winds}}{\text{number of westerly winds}} \text{ at hour stated a.m.}}{\dfrac{\text{number of easterly winds}}{\text{number of westerly winds}} \text{ at hour stated p.m.}}$$

and have tabulated the numerical value of this ratio A : B. (see p. 164).

It will be seen that the ratio A : B is in all cases greater than unity; that is, there is at all these stations a distinctly greater tendency to easterly winds in the morning than in the evening; and that, though westerly winds are everywhere prevailing.

No one can possibly feel more thoroughly than I do how incomplete this table is. If I have shown that theoretically there may be such a diurnal variation of wind, closely connected with the changes of barometric pressure,

the very imperfection of the table, which is all I can produce as str[illegible] evidence, may perhaps lead to further investigation of a subject which see[illegible] to me to promise great results: results which may, indeed, affect the wh[illegible] scope of scientific meteorology.

Place.	Years.	A.M. (A).			P.M. (B).			A = [illegible]
		Hour.	E.	W.	Hour.	E.	W.	
Barnaoul (1)	1850-62	IX.	1	·923	IX.	1	1·885	2·[illegible]
Kalouga (1)	1851-63	VII.	1	1·359	IX.	1	1·524	1·[illegible]
Koursk (1)	1853-59	VII.	1	1 928	IX.	1	2·571	1·[illegible]
Ichim (1)	1852-61	VI.	1	1·156	X.	1	1·200	1·[illegible]
Various Stations in New York State (2)	1853-63	VII.	1	1·749	IX.	1	2·241	1·[illegible]
Elmira (2)	1853-60	VII.	1	·705	IX.	1	1·232	1·[illegible]
Oxford (2)	1853-56	VII.	1	4 257	IX.	1	8·000	1 [illegible]
Cortland (2)	1853-63	VII.	1	1·310	IX.	1	3·326	2·[illegible]

(1.) Annales de l'Observatoire Physique Central de Russie.
(2.) Results of a series of Meteorological Observations, made under instructions from the Regen[illegible] the University, at sundry Stations in the State of New York —4to, Albany, 1872.

DISCUSSION.

Captain TOYNBEE thought Mr. Laughton's paper was an excellent one, tho[illegible] he could not follow it entirely, but wished to read it. He was not satisfied [illegible] the old theory of diurnal range. He had found in square 40 (in the open [illegible] that during the months of January and February the NE Trade was extre[illegible] gusty, and wished to know if Mr. Laughton could account for this by his the[illegible]

Mr. STRACHAN thought that, notwithstanding the well-known ability of [illegible] author as a reasoner and expounder of facts, on a subject so involved, upon w[illegible] there were available so few results from facts, it was not to be expected that [illegible] results of speculation would be all accepted. Much in the paper migh[illegible] questioned, without detracting from its value and interest. A satisfactory the[illegible] could hardly be propounded until observations had measured the diurnal r[illegible] from the equator to the pole. The statement that the second maximum and [illegible] second minimum were not so great as the first must be received with some l[illegible]tation. Under some circumstances they are equal, under others the inequali[illegible] the other way. Diurnal barometric range must be investigated for geograph[illegible] position and for the time of year, that is, astronomical position. The s[illegible] heating effect seems hardly sufficient to account for the phenomenon; becau[illegible] it depended principally upon heat, it might be expected to be more marke[illegible] land, where the heat was greater and the range of temperature larger, th[illegible] sea. But in the same latitude as on land, out at sea, where the temperature [illegible] very uniform, the diurnal range of the barometer was equally great. The [illegible] culty in explaining it satisfactorily at present arises from our knowing too l[illegible] about its laws of variation with latitude, longitude, elevation above the sea, [illegible] the seasons. However, the subject was not being neglected: Mr. H[illegible] Simmonds had been working upon it for the past ten years as much as he co[illegible] deducing the diurnal range of the barometer from every available serie[illegible] observations made in any part of the globe, and he had brought together a [illegible] store of facts on this subject.

Mr. LAUGHTON quite agreed with what Mr. Strachan had said about [illegible] necessity of observations: unfortunately suitable ones are sadly wanting. [illegible] fact that the barometric variations are distinctly marked in the open sea, w[illegible] there is comparatively little change in temperature, may possibly enough s[illegible] that differences in the rate of evaporation produce similar effects to differen[illegible] in the increments of temperature; and can be consistently explained as act[illegible] in the same manner. He did not see that the gusty nature of the Trade, wh[illegible] Captain Toynbee had spoken of, can be referred to the same cause: he wo[illegible] however, be unwilling to express a distinct opinion on such a point, with[illegible] further consideration.

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

March 18th, 1874.

Ordinary Meeting.

Robert James Mann, M.D., F.R.A.S., President, in the Chair.

William Batten, Witton Road, Aston Park, Birmingham;
B. Francis Cobb, 9 Old Broad Street, E.C.;
Richard H. Curtis, 38 Barclay Road, Walham Green, S.W.;
James Park Harrison, M.A., Ewhurst, Godalming, Surrey;
Brownlow D. Knox, Ardmillan, Caversham, Reading; and
William Scott, Cauldron Place, Staffordshire Potteries,
were balloted for and duly elected Fellows of the Society.

The names of six Candidates for admission into the Society were read.

Mr. E. G. Aldridge, Mr. S. G. Denton and Mr. Charles Harding were admitted Fellows of the Society.

The following papers were then read:—

"An Attempt to establish a Relation between the Velocity of the Wind and its Force (Beaufort Scale), with some Remarks on Anemometrical Observations in general." By Robert H. Scott, M.A., F.R.S. (p. 109.)

"On the Sensitiveness of Thermometers." By G. J. Symons, F.M.S. (p. 123.)

"On the Weather of Thirteen Autumns." By R. Strachan, F.M.S. (p. 129.)

The Meeting was then adjourned.

April 15th, 1874.

Ordinary Meeting.

Robert James Mann, M.D., F.R.A.S., President, in the Chair.

Thomas W. Baker, 19 Townshend Villas, Richmond, Surrey;
Rev. Charles Gape, M.A., Rushall Vicarage, Scole, Norfolk;
Frederick Green, Villa Rosalie, Cannes, France;
Richard Lord, M.D., Gatefield House, Crewe;
Francis John Sparks, Bincombe House, Crewkerne; and
George Mathus Whipple, B. Sc., F.R.A.S., Oak Villa, Jocelyn Road, Richmond, Surrey,
were balloted for and duly elected Fellows of the Society.

The name of one candidate for admission into the Society was read.

Mr. R. H. Curtis, Mr. J. P. Harrison, Mr. B. D. Knox, and Rev. T. A. Preston were admitted Fellows of the Society.

The following papers were then read:—

"On the Climate of Patras, Greece." By Rev. H. A. Boys. (Communicated by G. J. Symons, F.M.S.) (p. 139.)

"Remarks on the Atlantic Hurricane of August 20th to 24th, 1873." By William Radcliff Birt, F.R.A.S. (p. 147.)

"On the Meteorology of December in the Southernmost part of the South Indian Ocean." By Robert H. Scott, M.A., F.R.S. (p. 149.)

"On the Diurnal Variations of the Barometer." By John Knox Laughton, M.A., F.R.A.S. (p. 155.)

The Meeting was then adjourned.

Donations received from April 1st to June 30th, 1874.

Presented by Societies, Institutions, &c.

Brisbane ..	General Registry Office ..	Thirteenth Annual Report fron Registrar-General on Vital Statisi By Henry Scott, Registrar-Gen
Copenhagen ..	L'Institut Météorologique Danois.	Bulletin Météorologique du Nord,] 1st to May 31st.
	" " ..	Specimen Charts of the Weathe Europe and the Atlantic, Decem to 6, 1873. By Captain N. Hoffmeyer, Dire
Cracow	K. K. Sternwarte	Meteorologische Beobachtungen, and May. By Dr. F. Karlinski, Director.
Fiume	I. R. Accademia di Marina	Meteorological Observations, Februa April.
London	General Register Office ..	Weekly Returns of Births and D 1874, Nos. 12 to 24.
	" " ..	Annual Summary of Births, Death Causes of Deaths in London and large Cities, 1873.
	" " ..	Quarterly Return of Marriages,] and Deaths, March 31st. By the Registrar-General.
	Institution of Civil Engineers.	Catalogue of the Library.
	" " ..	Supplement to ditto.
	Meteorological Office	Daily Weather Reports and Charts.
	"	Quarterly Weather Report, 1873, Pa By the Meteorological Committ
	Royal Society	Proceedings, Nos. 151, 152.
Manchester ..	Literary and Philosophical Society.	Memoirs, 3rd series, Vol. iv. (1871).
	" " ..	Proceedings, Vols. viii.-x.
	" " ..	" March 24th to April 7th.
Milan	Reale Osservatorio Astronomico.	Osservazioni Meteorologische, 1870. By Giovanni Capelli.
Oxford	Radcliffe Observatory....	Observations of Shooting Stars m the Radcliffe Observatory, Oxford (by Mr. Lucas), in the year 1873. By Rev. R. Main, F.R.S., Ra Observer.
Paris	Observatoire National ..	Bulletin International. By M. U. J. Le Verrier, Directo
	Observatoire Physique Central de Montsouris.	Bulletin Mensuel, March to May. By M. Marié Davy, Director.
Philadelphia ..	American Philosophical Society.	Proceedings, Nos. 90-91.
	" " ..	Transactions, Vol. xv. Part i.
Prague	K. K. Sternwarte	Magnetische und Meteorologische bachtungen, 1872. By Dr. C. Hornstein, Director.
Rome	Osservatorio del Collegio Romano.	Bulletino Meteorologico, Februar March. By Padre A. Secchi, Director.
St. Petersburg	Central Physical Observatory.	Annalen, 1872.

St. Petersburg	Central Physical Observatory.	Jahresbericht für 1871 und 1872.
	" "	Repertorium für Meteorologie, Band iii. By Dr. H. Wild, Director.
Sydney	Government Observatory	Meteorological Observations, October to December, 1873. By H. C. Russell, F.R.A.S., Government Astronomer.
Toronto	Education Office.........	Journal of Education, February, March and May. By Rev. E. Ryerson, D.D.
Upsala	Observatoire de l'Université	Bulletin Météorologique Mensuel, Vol. v. No. 13; Vol. vi. No. 1. By G. Svanberg, Director.
Utrecht	Royal Dutch Meteorological Institute.	Nederlandsch Meteorologische Beobachtungen, 1872. By Dr. Buys Ballot, Director.
Vienna	K. K. Centralanstalt für Meteorologie und Erdmagnetismus.	Beobachtungen, March and May. By Dr. C. Jelinek, Director.
	Oesterreichische Gesellschaft für Meteorologie.	Zeitschrift, Band ix., Nos. 7-12.
Washington ..	Department of the Interior	First, Second, and Third Annual Reports of the U.S. Geological Survey of the Territories for the years 1867, 1868, and 1869. By Dr. F. U. Hayden, U.S. Geologist.
	Smithsonian Institution	Tables, Meteorological and Physical, prepared for the Smithsonian Institution by Arnold Guyot, Ph. D.
	" "	Directions for Meteorological Observations, and the Registry of Periodical Phenomena.
	" "	Queries relative to Tornadoes.
	" "	Instructions for Observations of Thunderstorms.
	" "	Circular relative to Heights.
	" "	Directions for constructing Lightning-rods.
	" "	Appendix. Report of Auroral Phenomena observed in the higher Northern Latitudes. Compiled by Peter Force.
	" "	Magnetical Observations in the Arctic Seas by Elisha Kent Kane, M.D., made during the second Grinnell Expedition in search of Sir John Franklin in 1853, 1854, and 1855, at Van Rensselaer Harbour, and other points of the west coast of Greenland. Reduced and discussed by Charles A. Schott.
	" "	Results of Meteorological Observations made at Brunswick, Maine, between 1807 and 1859. By Parker Cleaveland, L.L.D. Reduced and discussed by Charles A. Schott.
	" "	Tables and Results of the Precipitation, in Rain and Snow, in the United States, and at some stations in adjacent parts of North America, and in Central and South America. Collected by the Smithsonian Institution, and discussed under the direction of Joseph Henry, Secretary, by Charles A. Schott. By Prof. J. Henry, Secretary.

Presented by Individuals.

Barham, Dr. C.	Meteorological Notes, Cornwall, for 1873.
Curtis, John	Meteorological Observations at Heaton Chapel, near Manchester, for the week ending April 30th.
Delaney, John	Meteorological Observations at St. John's, Newfoundland, January to May (MS.).
Dines, George	Chart showing the Rainfall of the London District for 60 years, 1813-1872. By George Dines.
Forbes, Arthur	Meteorological Summary, Culloden, Inverness, May (MS.).
Gloesener, M.	Sur le Météorographe Enregistreur de M. Van Rysselberghe; par M. Gloesener.
Higgs, Rev. W., LL.D. ..	The Telegraphic Journal and Electrical Review, Nos. 28-33.
Hoskins, Dr. S. E., F.R.S.	Meteorological Observations taken at Guernsey, March to May.
Jordan, W. L., F.R.G.S. ..	The Ocean; its Tides and Currents, and their causes. By William Leighton Jordan.
Loomis, Elias, LL.D.	A Treatise on Meteorology. With a collection of Meteorological Tables. By Elias Loomis, LL.D.
Lowe, E. J., F.R.S.	Natural Phenomena and Chronology of the Seasons; being an account of remarkable frosts, droughts, thunderstorms, gales, floods, earthquakes, &c.; also diseases, cattle plagues, famines, &c.; which have occurred in the British Isles since A.D. 220, chronologically arranged. By E. J. Lowe, F.R.S. Part i.
Meldrum, C., F.R.A.S.	The Mauritius "Overland Commercial Gazette," April 4th, 1874.
Miller, S. H., F.R.A.S. ..	The Fenland Meteorological Circular and Weather Report, Nos. 1-5.
Mohn, Dr. H.	"Alberts" Expedition til Spidsbergen i November og December og dens videnskabelige Resultater. Af H. Mohn.
" "	Om visse Virkninger af Strömme paa Vandets og Luftens Temperatur. Af H. Mohn.
Munn, A.	Observations taken with Schönbein's Ozonometer at Harbour Grace, Newfoundland, December 1873 to February 1874 (MS.).
Pastorelli, F.	Pastorelli's Wind and Weather Indicator.
Power, Dr. R. E.	Meteorological Observations at Dartmoor, March to May (MS.).
Quetelet, E.	Funérailles de Lambert-Adolphe-Jacques Quetelet, Secretaire perpétuel de l' Académie Royale de Belgique.
Silver, S. W.	The Colonies, Nos. 157-163.
" "	Handbook for Australia and New Zealand, with Seasons chart of the World.
Smith, Dr. R. A., F.R.S...	Air and Rain. The Beginning of a Chemical Climatology. By Robert Angus Smith, Ph. D., F.R.S.
Symons, G. J.	Symons's Monthly Meteorological Magazine, April to June.
" "	Supplement to the Monthly and Quarterly Returns of the Births, Deaths, and Marriages registered in Scotland during the year 1873.
The Editor	"Nature," Nos. 231-243.
Turtle, Lancelot	The Weather at Aghalee during the months of March to May.
Van Rysselberghe, M. F...	Notice sur un système météorologique universel; par M. F. Van Rysselberghe.
Walker, C. V., F.R.S.	Portrait of John Lee, LL.D.
Watrehouse, J., F.R.S. ..	Eight Years' Meteorology of Halifax, being a record of Observations taken at Well Head during the years 1866 to 1873 inclusive. By John Waterhouse, F.R.S.

QUARTERLY JOURNAL

OF

THE METEOROLOGICAL SOCIETY.

VOL. II. No. 12.

Abstract of the "British Association" Memorandum on the Observation of Periodical Natural Phenomena; drawn up by the PRESIDENT, *at the request of the Form Committee, for the information of Fellows of the Meteorological Society.*

DURING the Meeting of the British Association for the Advancement of Science, which was held at Cambridge in 1845, a Report of a Committee on the Registration of Periodical Natural Phenomena was presented, which mainly consisted of a Series of Instructions and Remarks that had been previously prepared at Brussels by M. Quetelet, with the co-operation of other distinguished continental naturalists, among them MM. Cantraine, De Selys-Longchamps, Dumortier, Kickx, Martens, Spring, Wesmael, Donkelaer, Mowen, Deville, Robyns, Gastone, Van Beneden, Galeotti and Schwann. This Brussels memorandum was very full and interesting; and it now seems to be desirable,—in connection with the effort which is in progress on the part of the Meteorological Society to arrange the co-operation of certain of the other scientific societies with its own Fellows to carry out investigations of this class,—to draw attention to the leading principles which were accepted in that Report.

The distinguished continental naturalists who have been named, started with the assumption that meteorologists must of necessity take the lead in investigating such Periodical Phenomena of Nature as depend on the progress of the seasons. The various manifestations furnished by living organised beings are held to be the most important of these phenomena; but certain physical conditions require to be accurately noted in connection with them from day to day. The foremost of these merely physical conditions are:—the highest and lowest air temperatures of the day; the intensity of solar radiation at different hours of the day; the temperature

of the soil and of water at various depths; the humidity of the air; rainfa and snow; frost; occurrence of storms; the direction of the wind; th movements and aspects of the clouds; and the state of the sky.

It is considered that annual phenomena of periodicity are very muc more important than diurnal; but that manifestations of diurnal influenc are interesting as subordinate and correlative phenomena.

In reference to the Vegetable Kingdom, the leafing, flowering, fruitin and shedding of the leaf of certain standard plants are to be noted abov all things. In doing this, annuals and biennials are to be avoided, with th exception of the autumn cereals, such as rye, wheat and winter barley which are always sown about the same time; and the attention is to b concentrated upon woody perennial plants which have not been planted withi the year. All plants that flower throughout the year, and all cultivate plants that are prone to develop varieties under cultivation are to b excluded from notice, as are, also, all species that are uncertain o of difficult identification.

The plants that are observed must be in open ground, under fair averag circumstances of exposure; and they must on no account be within thic shelter, or under the influence of a south wall.

The period of flowering is a more important indication in general tha the period of leafing, or fruiting, or the time of shedding the leaves.

The leafing is to be noted when the leaf first bursts the bud, and is ju so far advanced as to expose an active surface to the influence of the ai and to allow the commencement of its vital functions. Flowering is to b noted at the instant when the anthers become visible. Fruiting, when gapi fruits burst or split their pericarps, or when other fruits have obvious ripened to maturity. The shedding of leaves is to be noted when t greater part of the leaves of the year have fallen.

A record should generally be made of the aspect in which the plant placed, and also of the fact whether it is growing in shade or in open su shine. It is important that the highest and lowest air temperature the day on which any observation is made should be carefully recorded connection with it. All remarkable modifications of odour, or of the colo both of leaves and flowers, should be registered.

The hour of the day at which certain excessively sensitive plants op and close their flowers should be marked.

The following extract from a recent Report of M. Delaunay's is tak from the Year Book of the Observatory of Paris for 1872, and is well wor of remark in connection with this subject:—"The observation of the the mometer is necessarily restricted to a limited number of stations, two three hundreds at most. Plants, on the other hand, grow everywhere, a also everywhere epitomise in themselves the succession of meteorologi facts that is accomplished around them."

With regard to the animal kingdom, what is most required is to ascert in what manner living animals are influenced by the state of vegetation, t condition and temperature of the air, and other physical circumstanc

dependent upon change of season. The period of coupling, of birth or hatching, of moulting, of migration, of hybernation, the first appearance of new species, and the exceptional rarity, or abundance, of any species, requires especial record in connection with that of meteorological conditions. In reference to mammals, the circumstances that are specified as calling most prominently for notice are:—the appearance and retreat of Bats; the frequency, or rarity, of insect-feeding Moles, Shrew Mice, and Field Mice; the commencement and end of the sleep of the Dormouse; the moulting of the Stoat and Weasel; the appearance and winter retreat of the Badger. Among reptiles, the retreat, re-appearance, and pairing of Frogs, Toads, Salamanders and Efts.

Birds afford exceedingly valuable indications of the progress of the seasons. The species which require most attention are those which only spend the summer and breed in the United Kingdom; those which pass without remaining; those which reside in England only through the winter; and occasional visitants.

It is also desirable to remark when Crows, Linnets and Starlings collect into flocks, and pair off; when the Magpie commences its nest; when the Sparrow becomes amatory and quarrelsome, and when it commences its nest.

A long and full List of Plants and Animals which were deemed most suitable for these periodic observations was furnished in the Brussels Memorandum; and a similar, but smaller list, drawn up by M. Decaisne, one of the Professors of the Jardin des Plantes at Paris, is given in the Year Book of the Observatory of Paris for 1872. It is desirable, however, that these lists should be carefully revised and modified by experienced English naturalists, to adapt them for use in England. The Form Committee of the Meteorological Society purpose to secure such a revision, as one of the objects of the Conference that is about to take place, and hope that they will soon be in a position to submit such revised lists to the consideration of the Society.

XVII. *Some Remarks on the Estimation of Wind Force, and on the Relation between Pressure and Velocity.* By CHARLES O. F. CATOR, M.A., F.M.S.

[Received April 13th. Read May 20th, 1874.]

BEING unfortunately absent from the Meeting on 18th March, and thus prevented having the advantage of taking part in the Discussion on Mr. Scott's Paper upon a portion of this subject, it has occurred to me that it might be useful to throw into the form of a Paper those remarks, the substance of which I should otherwise have offered verbally. In the first place, I may be permitted to express my satisfaction at the attention devoted to the subject, and my conviction that it merits all the care Mr. Scott has given to it.

I think that observations, or the results of them, derived from *estimation* of the force of the wind, are not at all to be relied upon, as it appears to

me to be impossible to estimate force with any degree of accuracy. In the first place, it would be most improbable that two persons would at the same time and at the same place estimate the same force at the same figure, or even that one person would at different times describe the same force by the same numeral; for, after a long continuance of very strong wind, one would be tempted to describe as 8 a force of perhaps 5, whereas at another time, after a long continuance of calm, one would probably consider as 5 a force of 8. I say this independently, and from analogy with temperature; for after a very hot period, the thermometer averaging its maximum perhaps 80° or upwards for a few days together, and then if the maximum were suddenly to drop down to 60°, one would naturally feel it chilly, and fancy it were not more than 50°: and *vice versâ* after a sudden change from cold to heat. But such great extremes of temperature cannot be experienced in so short intervals of time as great extremes of wind, which last often happen within the space of a few minutes, and therefore the argument is stronger in the case of wind than in that of temperature. In fact, it appears to me that any useful results from observations of the force of the wind, *must* be obtained from *instrumental* observations. Indeed, I think it so difficult to *estimate* Force accurately, that I omit it altogether from my daily observations.

As to a Comparison of Pressure with Velocity, I believe that simultaneous records of a Pressure-Anemometer and Robinson's cups *with the instruments and scales now in use* are utterly inconvertible; but I believe a comparison to be practicable if the observations from a Pressure-Anemometer were made on an extended scale, say, of such a size that three inches would represent one hour; for from a scale of this size the mean pressure could be deduced by examination of the traces of each gust for every few minutes, and so on, if necessary, for any number of hours required, and thus might be compared with the corresponding velocity from a Cup-Anemometer for the same period. This, however, though a laborious task, would be quite practicable and worth the trouble, because from the calculations of such records of merely a few days' wind, a tolerably approximate comparison might be obtained. I believe, however, a much more simple and accurate method is quite possible for obtaining the *true* mean pressure of the wind by the application to any Pressure-Anemometer of an apparatus for measuring the aggregate of all the pressures for every moment during any given time, either five minutes, an hour, or twenty-four hours, and thence of course an accurate mean could be deduced; that is, a true mean *could* be obtained of all the traces which would be shown by the recording pencil: and if once a true mean pressure were obtained, a correct comparison between velocity and force would follow. This apparatus it is my intention to attempt to construct, and I shall then be happy to lay the results before the Society. As to the conclusion to which Mr. Scott came that Velocity is preferable to Pressure, I agree with him only so far as regards the determination of an aggregate result for any number of hours, or of getting means of such periods from present scales; but it must not be forgotten that details of any short period can be got not from Robinson's Cups, but only from Pressure-Anemometers.

With reference to very great pressures, which have, I believe, in a few instances been recorded, such as 70 or 80 lbs. on the square foot, I can hardly think, or at any rate it is difficult to believe, that such pressures could be correct records; as if so, it would scarcely seem possible for any buildings to stand against them; but that the recording pencil must in such cases have been moved too far forward with a jerk, or have gone beyond the point which was due to the real influence of the wind. In cases where more than 80 miles in one hour have been recorded, the velocity of momentary gusts must have been, I should say, not a hundred, but considerably over a hundred miles an hour, as the velocity of these momentary gusts is *very much greater* than the average for any one hour, and this information cannot be obtained except from the records of a Pressure-Anemometer; nor by Robinson's Anemometer, even if provided with an extremely open scale.

As to the difficulties of instituting a comparison between Velocity and Force: 1. I understand that the Beaufort scale was arrived at from the movements of a ship: for the lower numbers, by the speed of a travelling ship; and for the higher numbers, by the amount of sail a ship can carry. For the lower numbers, it would appear to be a satisfactory mode, so far as it goes; but then, to be of any use, an observer of the force of the wind must always have such a ship before him, and know its speed, in order to be able to determine the force, because of the impossibility of estimating correctly without it; and of course this means of getting at the force would be absurd. —For the higher numbers, the mode is very unsatisfactory, as that again depends upon the captain's estimation of the wind's force in the amount of sail he puts up, which last would again vary according to the condition of the ship and its gear. And still more unsatisfactory is the difference of standard for the lower and higher numbers. This, again, shows that force cannot be satisfactorily ascertained by such a method.

2. During the time of observation, say two minutes, force varies; but the corresponding velocity is not shown by Robinson's Cups: on this I would remark, that it is almost impossible to describe what the force is at any time by *one* number, if, as I suppose, each number means an absolute force, because the wind is in itself ever varying in strength almost from moment to moment, and therefore a force during the time of such observation could only practically be spoken of as "*a varying force*," viz. say 2 to 4, or 3 to 5, or 3 to 6, &c. If this view of describing the force of the wind at any time be correct, then for the sake of convenience single numbers might still be used, as I. II. III. IV. &c.; but in this case I. would correspond to what has before been referred to as 0 to 2, II. as 1 to 3, III. as 2 to 4, and so on. —It will be understood that this hypothetical description of the wind's force is distinct from the question of how it is arrived at, whether by estimation or instrumental observation.

3. Conditions of exposure. This certainly makes a very great difference. Mr. Scott remarked that Holyhead is the most windy station, and accounted for it from its insular position. This is no doubt one reason for it, but it strikes me that another reason is because with S-SW winds (one of the most

frequent of strong winds) it is quite open to the direct influence of the Atlantic, and again because, being in a channel, the volume of air which entered it between the south of Ireland and Cornwall, when it gets to Holyhead, becomes condensed into a narrower channel, and therefore more air has to pass through in a given time than over a wider and more open surface, and so the velocity is greater. Although this remark might not apply to the whole width of the channel, yet, I fancy, it would for places along the coasts, and a short distance from them, and for a comparatively low altitude. I believe Mr. Scott did not say whether the peculiarity of Holyhead for windiness applies to wind from all quarters, or only to wind from any particular direction, but I have assumed it to be so from S to SW only. I should fancy that the peculiarity about Holyhead with winds from S to SW would equally apply to such places as Brighton with W to SW winds, or to Margate and Yarmouth with NE winds.

Then, again, why is the velocity as observed, different from different directions, although the force may be the same? and why do these difference vary in different degrees at different places?—I can imagine this to b accounted for principally (and in addition to the extreme difficulty of esti mating correctly) by the position of the observer being at most, if not all the stations, not identical with that of the cups; which I presume to be th case: if the observer were to stand by the side of the cups, I think his esti mate of force (assuming it, for the purpose of this argument, to be possible t estimate it) must always be the same for the same velocity and the sam density; and it would seem that it must be so, because a velocity cannot b conceived really to vary with winds from different directions while the forc remains constant (except perhaps a slight variation for a reason to b mentioned hereafter): but the reason why the velocity should be found vary with wind from different directions, while the force to the observ appears to remain the same, is because the position of the observer is n identical with that of the cups; for instance, suppose that at any particul station the wind when blowing from the most open quarter with a force 5 as estimated, might correspond with a velocity of 30 miles an hour, b when blowing from another quarter with the same force, the surroundi objects (whether buildings, or rising ground) might cause it to affect *the cu* differently from the observer, who would probably be at a lower elevation 20, 30, or even 50 feet; that is, the wind from the last supposed direction mig be lifted up or reflected, and so cause the difference, and thus force 5 to t observer, might correspond with the velocity of 20 or 25 miles an hour one case, and perhaps 35 miles in another, from altered circumstances: other words, I should suppose that to an observer at a given station t same force would always correspond with the same velocity from the sa direction, whatever direction it might be; for example, at any one station force of 5, as observed, would always represent the velocity of say 30 mi as registered by the cups with a W wind; and would always represen velocity of say 25 miles with a S wind; and again, perhaps, say 20 mi with an E wind. And at another station, other corresponding amounts

rce, as estimated by the observer, and velocity, as registered by the cups, ight obtain.

The reason referred to above, why a certain force might not always be uite the same for a certain velocity, is that due to differences of the ressure of the atmosphere as indicated by the height of the barometer; or it is reasonable to suppose that the force corresponding to any velocity hen the barometer is low, would be slightly greater for the same velocity hen the barometer is high, on account of the greater momentum generated y heavier moving air; but the difference due to this cause would not, I pprehend, even in extreme cases, be more than 6 or 8 per cent.

There are four methods of describing the gradations of wind, viz.:—

1. Pressure in lbs. on the square foot.
2. Velocity in miles per hour.
3. Beaufort's, or sea scale, 0-12.
4. Land scale, 0-6.

The first two from instruments, the last two from estimation.

As to the first two.—It is the main end of the present discussion, to es- ablish a relation between pressure and velocity. If P represent pressure, nd V velocity, then for every pressure, P_1, P_2, P_3.................., there ust be a corresponding velocity, V_1, V_2, V_3,.................., and these do ot increase in the same ratio, because $P=\rho V^2$, but in the gradations of he Beaufort scale (which is generally adopted by estimating observers), and n which they are described as force 1, force 2, force 3............,—thus artaking of the idea of force,—they are not assimilated to the gradations f pressure (which is force under another name), but according to certain rbitrary and unequal gradations of velocity up to a certain point, and thence- orward they have reference to no fixed standard at all, but merely to certain rbitrary acts of the captain of a ship. This surely cannot be considered a atisfactory mode of describing the increasing amounts of wind; but surely here ought to be a reference to some *fixed standard* of increase, either of elocity or pressure, viz. that a scale from 1-12

If based on *velocity*, should be as follows;—

Say, force 1	=	8	miles	per	hour.
,, 2	=	16	,,		,,
,, 3	=	24	,,		,,
,, —	=	—	,,		,,
,, 11	=	88	,,		,,
,, 12	=	96	,,		,,

Or if based on *pressure*, should be as follows:—

Say, force 1	=	5	lbs. on square foot.
,, 2	=	10	,,
,, —	=	—	,,
,, 11	=	55	,,
,, 12	=	60	,,

From the above it will be seen that the supposed increments of wind, whether estimated with reference to velocity or force, are equal, and therefore

an observer, in speaking of the wind, or comparing the observations of one day with those of another, would have something definite in his mind on which to base such comparison; for instance, that one wind was two, three, or four times as strong as another, or that the velocity of one was two, three, or four times as great as that of the other, according as he adopted pressure, or velocity, as his standard; and this cannot be done by the present Beaufort scale. The question would then arise, which of these two is the more desirable standard to adopt? and to my mind there is no doubt that that of *Pressure*, or force, should be generally adopted, for it would seem plain to any one going out and exposing his face to the wind for the purpose of an estimate, he would naturally say to himself, "How strong is the wind?" not "How quickly is it travelling?" and for a still more simple reason, that one cannot feel a velocity, but one can feel a force, and this from the very nature of the thing, as velocity is merely a rate, while pressure or moving force is an element of four dimensions: and even if one were to try to estimate the velocity of the wind, it must be through the medium of an estimate of its force. Again, force is after all *the* thing required, because it is the *force* of the wind which demolishes buildings and uproots trees: it is *force* which drives a ship along: it is *force* which drives the clouds along: and lastly, it is *force* which drives everything which is included in the term "the weather" itself along, and therefore I think it is clear that it is *force* to which attention should specially be directed, and that *it* is the element which should be the principal basis of observation, whether from instruments or estimation.

DISCUSSION.

Mr. Scott stated that the objection that he had to pressure-anemometers was that it had not yet been determined what the area of the normal pressure-plate should be, *e.g.* the results afforded by a plate of one square foot area not being accordant with those obtained from a plate double the area, and so a pressure of 40lbs. per square foot on the instrument did not indicate truly the pressure exerted on a large building. There could be no doubt that records of gusts, &c. could only be obtained from pressure instruments; but still he considered that the measurement of velocity was a safer standard to go by, owing to this serious difficulty as to the area of the pressure-plate. Accordingly, the Meteorological Committee had not adopted pressure-anemometers. With reference to the want of uniformity in the standard for Beaufort's scale, the defect was serious; but how was a thoroughly unexceptionable test of force to be obtained at sea? Beaufort's ship, a cruising frigate of the year 1806, was a thing of the past; its nearest representative was a modern clipper ship. Mr. Cator seemed to imply that the observer was more likely to be subject to influences of obstacles, &c. than the instruments; but at Yarmouth that was not the case, the anemometer was on shore, but the observations used to test it were taken on board the St. Nicholas Gat Lightship, about two miles from the shore, so that the wind must blow reasonably true there.

The President remarked that Mr. Scott's statement as to the effect of neighbouring buildings in retarding or disturbing the movement of an anemometer was just at this time receiving a marked illustration at South Kensington, where Gordon's electrical anemometer had been erected in connection with some experiments that are in progress to test the relative value of stoves and ranges. The cups and vanes of the instrument are placed on the roof of the testing houses, a low structure just under the lee of one of the lofty galleries, and the anemometer certainly registers much too little movement of air during all gentle winds.

Dr. TRIPE considered the Paper to contain many points of interest, and some of considerable value. He objected, however, to No. 1 on the scale corresponding with so large a range as 0-8 lbs. pressure of the wind on a square foot. He also thought that the expression "we do not feel velocity, but force," as somewhat objectionable, as the velocity of a moving body arises from the force expended to set it in motion, and the phrase seems to separate velocity from force. We certainly feel a solid body moving with a high velocity more than we do if it is moving slowly, and we therefore may estimate velocity by the force with which we are struck. He did not believe that pressure gauges can be made to register the velocity of wind with certainty, in consequence (1) of the extreme mobility of the molecules of the air one upon another, and (2) of the varying density of the atmosphere.

Mr. BROOKE said it was quite impossible to obtain a general relation between the velocity of the wind and the pressure on an unit of surface: as it is well known that the indicated pressure of the wind on surfaces of different areas is not proportional to the area impinged upon. Moreover, in some experiments recently conducted, on the pressure of air on oblique surfaces, it was found that if a rectangular plane, of which the length was four or five times the width, were placed at a given angle to the direction of the current of air, the pressure varied according as the long or short diameter was placed obliquely to the current at the same angle.

Mr. LAUGHTON thought that Mr. Cator had placed too low a value on the estimation of wind. On board ship, men are trained to make such estimates, almost from their childhood: and far from differing widely one from another, as had been supposed, no difference worth speaking of is to be found in the estimates made by any number of watch-keeping officers. Again, it had been said, that as the estimates are formed with reference to the sail a ship will carry, they must vary according to the quality of each particular ship's equipment, but, in fact, no such variation is possible; for the Beaufort scale does not refer to the particular ship in which the observer is, but is distinctly defined to be for "a well-conditioned man-of-war," a term which conveys an idea sufficiently exact to every naval officer. There is thus, practically speaking, and from a naval point of view, no ambiguity at all about estimate.

He was also inclined to believe that on shore estimation had many advantages even over a velocity anemometer: for the anemometer being confined to one spot, can scarcely ever—as Mr. Scott had pointed out—be free from local influences, and must thus often show most anomalous results; whereas a skilled observer, forming his estimate whilst moving about from place to place, watching smoke or flags in the neighbourhood, is guided by everything which he can see or feel: his observation is thus for the place as a place, and not for an isolated point of some three feet in diameter.

Mr. DINES did not believe in wind pressures of 60 lbs. to the square foot. He was sure that many chimneys could never stand against such a pressure.

Mr. CATOR replied as follows:—

As to the difference of effect on small and large surfaces, he could not speak from experience, having only tried a surface of one square foot.

As to the competing claims of force and velocity, he repeated that force was the more important of the two, because the element referred to is the resistance which a surface has to encounter from the force exerted by the moving air; and this moving force, or momentum, is the mass multiplied by the velocity, and therefore, so to speak, includes the velocity as part of it.

As to Dr. Tripe's doubt about the correctness of the expression used that "one could not feel a velocity," he, Mr. Cator, still submitted that such must be the case, as *velocity* is merely a rate, and mathematically speaking, a quantity of only one dimension; but that the *moving force* or resistance which a surface has to encounter is the effect produced by the wind, and is what the exposed surface feels.

As to the Beaufort scale, the way in which it was got at, he considered, was beginning at the wrong end, viz. by taking uncertain and arbitrary acts, and making the scale therefrom; but that it should be made from some certain and defined basis, *i.e.* that the numbers of the scale should represent certain numbers of miles per hour, or certain numbers of lbs. on the square foot; and having got a scale thus, *then* that observations should be made with a view to determine

the relation between each of the numbers of such scale and the several amounts of sail a ship can carry.

As to the division of the proposed scale, if 0-8 be too wide apart, he would be quite willing it should be divided into smaller divisions, *i.e.* 0, 4, 8, &c.

As to the powers of estimation, although perhaps seamen might be more competent to estimate than landsmen, he repeated his conviction that it was impossible to estimate correctly, as one's senses were fallacious guides, not only for estimating the wind, but for every other meteorological element, as it depended so much upon one's state of health, &c.

As to the influence of buildings, &c. this would of course affect Robinson's cups as much as pressure-anemometers.

XVIII. *The Weather of Thirteen Winters.* By R. Strachan, F.M.S.

[Received April 13th. Read May 20th, 1874.]

Summary and Remarks for December.—The duration of daylight on the middle day of the month is 7h. 46m. The sun attains his greatest south declination on the 21st. The temperature rises by *day* to an average of 45° and falls by *night* to 37°. The medium temperature is 41°, with a mean range of 8°. The 9 a.m. observations give very closely the medium temperature. The mean atmospheric pressure, at 9 a.m., is 29·99 inches, and the resultant of the winds W by S½S. The average rainfall is 2·03 inches on 15 days, including snow on 2 days. There are usually 20 overcast days against 11 cloudy. Clear weather very seldom occurs for an entire day. Mist averages 10 days, fog 2, and squally or stormy weather is frequent.

Decembers 1865 and 1873 were remarkably similar in regard to pressure, temperature, rainfall, weather, and resultant winds. They had the maximum pressure with the minimum rainfall. The predominance of south-westerly winds appears to have maintained the temperature just above its mean value.

Decembers 1868 and 1872 were also remarkably similar, and in contrast to 1865 and 1873. They had the lowest pressure, the highest temperature, the maximum amount and frequency of rain, and steady WSW winds; yet there was rather more fine weather than with the highest pressures. These high mean temperatures seem to be related to the abundance of rain. The maximum temperature was in 1868, with the largest amount and frequency of rain.

The lowest temperature was in 1870 with predominant NE winds; yet the pressure was slightly below the average, and there was much and frequent rain, including snow on 7 days, and excess of overcast weather.

In December 1864 the prevalent winds were from ESE, with snow on days and rain on 4 days, amounting only to 0·51 inch. The pressure was *par*, and the temperature below. The weather was very misty.

That the temperature and rainfall of 1864 should have differed so much from those of 1870, while the chief wind of the former was ESE and of the latter NE, only differing in azimuth 68°, seems anomalous.

Could we know the conditions of the upper aerial currents, which Mr. Glaisher found to prevail in the winter season in our latitude, some explanation might be apparent for this anomaly.

The variability of the weather in December is shown by all the meteorological elements. The mean pressure has been as high as 30·27 inches, and as low as 29·57 inches; the mean temperature, at 9 a.m., up to 46°·4, and down to 33°·8; the rainfall as much as 4·53 inches on 25 days, and as little as 0·41 inch on 7 days; the resultant wind has reached WSW force 2·7, whilst the NE has overpowered the equatorial current by force 0·6. Six Decembers were without snow, one had snow on 7 days; several had 24 days of overcast sky, none had less than 14. A day of blue sky is quite exceptional.

Summary and Remarks for January.—The sun is now decreasing his south declination, and on the middle day is about 8h. 20m. above the horizon. The mean highest temperature by *day* is 43°, and the mean lowest by *night* 34°; so that the medium temperature is about 38°·5, and the mean daily range 8°·5. The 9 a.m. observation gives the medium temperature. The average height of the barometer is 29·87 inches, with resultant wind from SW b W. The rainfall averages 2·52 inches on 17 days, including snow on 3 days. About 20 days are usually overcast, 10 fine, 1 very fine. Mist averages 8 days, fog 2; and squally or stormy weather is as common as in December.

The maximum pressure was in 1864, with polar winds as frequent as the equatorial; the temperature was below the average, the frequency and amount of rain the least, and the weather comparatively fine.

January 1861 was similar to 1864 in all respects.

January 1865 was also similar to 1867, but the pressure was the lowest. They had very little easterly wind, yet their temperature was below the average, the more so by night. The rainfall was above the average. The general state of the sky was not exceptional, but snow fell on 8 days.

January 1872 had also a very low pressure, with predominant SW winds; but the temperature was above the average, the rainfall excessive and at the maximum frequency, and there was *no snow.*

The minimum temperature was in 1871, with prevalent NE winds, snow on 5 days, pressure at *par*, rainfall below the average, the sky almost always overcast.

The highest temperatures occurred in 1863 and 1866, with pressure about *par*, rainfall excessive, 1866 having the maximum amount, winds prevalent from WSW, and weather finer than usual.

January is on the whole the coldest month of the year, and in variability is little better than December. The mean pressure has been as high as 30·235 inches, and as low as 29·596 inches; the mean temperature up to 43°·2, and down to 33°·6; the rainfall as much as 3·92 inches on 22 days, and as little as 1·09 inch on 11; the resultant wind has reached WSW, force 2·8, whilst the NE has overpowered the equatorial by force 0·3. Six Januarys were without snow, two had snow on 8 days each; one had 26 days of overcast weather, none had less than 16. A very fine clear day is quite exceptional.

Summary and Remarks for February.—The sun is still south of the equator,

Results of Meteorological Obser

Year.	Barometer.	Temperature.			Rainfall.		
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.
	In.	°	°	°	In.		
1861	30·150	40·7	45·5	37·9	—	—	1
1862	30·036	44·1	48·1	39·8	1·44	17	2
1863	30·121	43·3	48·1	37·4	1·32	9	—
1864	29·993	38·5	42·7	33·6	0·51	8	—
1865	30·254	42·7	47·0	39·4	0·81	12	—
1866	29·982	43·7	48·8	39·3	2·22	16	—
1867	30·041	38·6	43·7	33·5	2·16	15	1
1868	29·572	46·4	51·1	42·7	4·53	25	—
1869	29·805	38·0	42·4	34·6	2·39	14	2
1870	29·907	33·8	38·2	30·3	3·00	19	2
1871	30·118	38·4	42·4	35·8	1·08	16	—
1872	29·558	42·5	47·1	39·9	4·44	21	—
1873	30·272	40·7	45·4	37·2	0·41	7	1
Means	29·988	40·9	45·4	37·0	2·03	15	1

Observations of Wind, referred to 16 P

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.		
	o.	F.	o.	F.	o.	F.	o.	F.	o.	F.	o.	F.	o.	F.	o.	F.	o.
1861	1	4·0	4	2·2	2	3·5	4	2 8	4	2·0	—	—	1	1·0	1	1·0	2
1862	3	3·7	—	—	—	—	—	—	3	2·7	—	—	1	2·0	—	—	2
1863	2	4·5	1	3·0	—	—	—	—	1	2 0	—	—	—	—	1	4·0	1
1864	1	1·0	1	4 0	1	5 0	2	4·5	7	2·9	2	1·5	1	1·0	1	2·0	1
1865	1	2 0	1	3·0	3	1·7	2	2·5	1	1·0	1	1·0	—	—	1	2·0	3
1866	—	—	—	—	—	—	—	—	1	2·0	—	—	—	—	—	—	3
1867	4	2·8	1	2 0	1	1·0	—	—	2	1·5	—	—	—	—	—	—	2
1868	—	—	1	3·0	1	3 0	—	—	1	4·0	—	—	—	—	1	2 0	2
1869	2	2·5	—	—	4	3·2	3	2·0	5	1·8	—	—	—	—	—	—	—
1870	5	2·0	2	1 5	4	2·5	1	1·0	7	4·3	—	—	—	—	—	—	—
1871	2	2·5	—	—	2	2·5	—	—	—	—	—	—	—	—	—	—	—
1872	2	2·0	1	2·0	—	—	2	2·5	1	3·0	—	—	1	1·0	—	—	2
1873	3	2·0	—	—	—	—	—	—	—	—	—	—	1	2·0	—	—	2
Means	2·0	2·6	0·9	2·4	1·4	2·7	1·1	2·6	2·5	2·7	0·2	1·3	0·4	1·4	0·4	2·2	1·5

en DECEMBERS at London.

at 9 a.m.			Notations of Day's Weather.					
m.	f.	r.	b.	c.	o.	m.	f.	lt.
13	5	2	1	16	14	12	1	—
18	2	2	—	14	17	22	—	—
7	3	1	—	15	16	8	3	—
8	4	2	—	9	22	18	1	—
10	5	2	—	10	21	12	3	—
6	2	4	—	7	24	9	2	—
4	3	4	—	8	23	5	5	—
4	1	3	—	13	18	7	2	—
8	1	3	1	12	18	6	1	—
9	1	5	—	7	24	9	—	—
12	—	2	—	7	24	7	—	—
9	1	6	—	14	17	3	—	—
9	4	1	2	5	24	8	7	—
9	3	3	—	11	20	10	2	—

force (by Scale 0 to 12).

	SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms	Resultant.	
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
-	5	3·0	—	—	2	3·5	1	3·0	2	4·0	2	2·0	—	N 5° W	0·3
-	7	4·4	3	2·3	6	3·2	1	8·0	3	6·3	2	4·0	—	N 85 W	2·0
-	7	4·7	6	3·0	7	4·4	2	3·0	3	2·7	—	—	—	S 75 W	2·6
o	6	2·0	3	3·0	1	1·0	—	—	1	1·0	—	—	2	S 66 E	0·6
5	7	4·6	2	7·5	1	1·0	—	—	1	1·0	2	1·5	3	S 47 W	1·3
o	5	3·8	10	2·9	7	1·9	1	1·0	1	1·0	—	—	2	S 57 W	2·2
-	2	2·5	2	2·5	7	2·6	2	4·5	2	1·5	—	—	6	N 80 W	1·0
5	5	5·4	3	5·3	13	3·5	—	—	—	—	—	—	2	S 64 W	2·7
-	—	—	4	4·7	10	3·1	—	—	1	4·0	—	—	2	N 67 W	1·0
-	2	4·0	2	3·5	3	4·7	—	—	—	—	—	—	5	N 48 E	0·6
-	6	5·0	3	2·0	10	2·5	1	2·0	2	1·0	1	2·0	4	S 78 W	1·7
3	7	3·6	2	4·5	6	3·2	—	—	—	—	—	—	4	S 53 W	1·7
-	5	2·4	3	3·7	11	2·3	—	—	1	1·0	—	—	5	S 76 W	1·4
	4·9	3·9	3·3	3·5	6·5	3·0	0·6	3·6	1·3	2·8	0·5	2·4	2·7	S 74 W	1·2

Results of Meteorological Observ

Year.	Barometer.	Temperature.			Rainfall.		
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.
	In.	°	°	°	In.		
1861	30.177	33.9	39.1	30.4	—	—	1
1862	29.883	39.8	43.4	35.7	1.86	19	—
1863	29.775	43.2	47.1	38.8	2.34	16	2
1864	30.235	36.1	40.1	31.9	1.09	11	2
1865	29.596	35.7	40.6	31.0	3.87	16	—
1866	29.875	43.0	47.7	38.9	3.92	22	—
1867	29.620	35.0	40.0	30.0	2.39	19	—
1868	29.935	37.6	41.5	33.8	3.56	20	—
1869	30.040	41.5	46.0	37.0	2.36	14	1
1870	29.993	38.4	43.0	35.5	1.43	17	—
1871	29.834	33.6	37.4	30.3	1.69	16	—
1872	29.638	41.0	45.7	37.7	3.38	23	—
1873	29.753	41.9	46.2	39.4	2.36	17	1
Means	29.873	38.5	42.9	34.6	2.52	17	1

Observations of Wind, referred to 16

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.	
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
1861	—	—	—	—	6	1.7	2	3.5	4	2.8	—	—	—	—	—	—
1862	1	2.0	2	2.0	2	1.5	—	—	—	—	2	3.5	—	—	4	4.3
1863	—	—	—	—	5	2.8	1	5.0	2	4.5	—	—	1	1.0	1	3.0
1864	—	—	1	1.0	5	3.0	3	2.0	3	2.0	—	—	3	1.7	1	2.0
1865	2	1.0	—	—	2	3.5	2	1.5	2	1.0	1	2.0	—	—	—	—
1866	—	—	—	—	—	—	1	6.0	—	—	—	—	—	—	—	—
1867	5	2.8	1	4.0	—	—	1	5.0	2	2.5	1	4.0	—	—	—	—
1868	1	3.0	—	—	3	1.3	3	1.7	4	1.5	1	1.0	1	2.0	—	—
1869	2	1.0	—	—	1	1.0	—	—	2	2.0	1	1.0	1	2.0	1	3.0
1870	1	1.0	—	—	4	2.5	1	3.0	4	2.0	1	1.0	—	—	1	2.0
1871	3	1.0	1	2.0	6	3.3	2	4.0	4	2.2	—	—	1	3.0	—	—
1872	2	1.0	—	—	1	1.0	—	—	—	—	—	—	—	—	—	—
1873	—	—	1	2.0	—	—	—	—	4	2.5	—	—	1	3.0	—	—
Means	1.3	1.7	0.5	2.2	2.7	2.4	1.2	3.0	2.4	2.3	0.5	2.3	0.6	2.0	0.6	3.4

rteen JANUARYS in London.

her at 9 a.m.			Notations of Day's Weather.					
m.	f.	r.	b.	c.	o.	m.	f.	lt.
3	7	2	—	15	16	9	4	—
14	3	4	—	10	21	18	3	—
9	1	3	—	15	16	9	3	—
14	—	4	1	14	16	13	5	—
7	2	4	—	9	22	10	2	—
4	3	8	—	13	18	8	1	—
4	—	5	1	9	21	5	2	—
2	3	3	—	8	23	4	2	—
13	3	4	—	13	18	13	2	—
7	2	2	3	7	21	7	1	—
12	1	4	1	4	26	9	1	—
4	3	5	2	5	24	2	—	—
—	1	—	—	13	18	1	—	2
7	2	4	1	10	20	8	2	—

ean force (by Scale 0 to 12).

.	SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms.	Resultant.	
F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
·7	5	1·8	3	2·7	4	1·3	—	—	2	1·5	—	—	1	S 3° W	0·3
—	6	5·3	2	4·5	3	4·7	2	2·0	3	3·3	—	—	—	S 43 W	1·9
·5	7	5·6	3	4·0	2	4·5	1	6·0	4	7·5	—	—	—	S 68 W	1·9
·0	8	3·8	—	—	2	3·5	1	4·0	—	—	—	—	1	S 18 W	0·6
—	3	3·3	5	5·4	9	2·7	1	1·0	1	2·0	—	—	2	S 73 W	1·6
·0	4	4·7	9	3·3	10	3·6	1	2·0	2	1·0	—	—	—	S 62 W	2·8
·0	3	3·3	2	5·5	8	2·6	3	2·3	1	4·0	1	1·0	1	N 75 W	1·2
·0	2	6 5	8	5·4	5	3·2	—	—	—	—	—	—	2	S 66 W	1·5
·0	5	2·4	5	4·6	7	3·1	—	—	—	—	—	—	1	S 59 W	1·7
—	3	1·7	2	5·5	10	1·7	—	—	—	—	—	—	4	S 86 W	0·4
—	3	3 3	1	9·0	5	2·6	—	—	—	—	—	—	2	N 50 E	0·3
·5	9	3·1	7	3·3	4	2·8	—	—	—	—	—	—	4	S 54 W	2·2
·0	8	4·5	3	6·0	10	4·3	—	—	—	—	—	—	1	S 61 W	2·7
·1	5·1	3·8	3·8	4·5	6·1	3·0	0·7	2·7	1·0	4·0	0·1	1·0	1·5	S 59 W	0·9

Results of Meteorological Obser

Year.	Barometer.	Temperature.			Rainfall.		N
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.
	In.	°	°	°	In.		
1861	29·871	42·1	48·2	38·1	—	—	2
1862	30·087	41·7	45·9	38·7	0·37	9	—
1863	30·326	41·4	48·0	37·2	0·52	9	2
1864	29·956	35·3	40·7	31·0	1·04	21	1
1865	29·903	36·4	40·9	31·7	2·41	20	6
1866	29·726	40·8	47·0	36·9	4·05	19	3
1867	30·090	45·0	50·0	41·3	1·41	11	1
1868	30·156	43·0	49·1	39·3	0·82	11	4
1869	29·987	45·6	51·1	42·6	2·30	16	4
1870	29·887	35·9	40·6	33·1	1·12	16	2
1871	30·029	42·0	46·8	38·6	1·18	14	1
1872	29·824	44·0	49·0	40·7	0·89	16	—
1873	30·095	34·3	38·6	31·8	2·02	15	—
Means	29·995	40·6	45·7	37·0	1·51	15	2

Observations of Wind, referred to 16

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.		
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.
1861	2	1·5	1	6·0	—	—	1	1·0	3	1·3	1	2·0	—	—	1	1·0	4
1862	1	1·0	—	—	2	3·5	5	3·2	1	4·0	3	5·0	3	2·7	2	2·0	—
1863	2	1·5	—	—	2	1·5	1	2·0	2	1·5	1	3·0	1	1·0	—	—	—
1864	4	2·5	4	2·3	4	2·0	2	2·5	1	3·0	2	2·5	—	—	—	—	—
1865	1	2·0	2	1·5	4	2·5	—	—	1	3·0	1	3·0	1	2·0	—	—	2
1866	5	2·0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
1867	2	2·0	—	—	1	3·0	—	—	3	2·0	—	—	—	—	—	—	2
1868	1	4·0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1869	2	2·5	—	—	—	—	—	—	2	3·0	—	—	—	—	—	—	—
1870	—	—	—	—	2	2·0	2	4·0	7	3·7	—	—	—	—	—	—	5
1871	—	—	—	—	2	2·5	1	3·0	2	3·5	—	—	1	1·0	—	—	—
1872	2	1·5	—	—	—	—	2	2·5	1	1·0	—	—	2	1·0	1	2·0	2
1873	8	2·1	1	6·0	3	4·0	2	4·0	2	1·0	—	—	—	—	1	3·0	—
Means	2·3	2·1	0·6	3·0	1·5	2·6	1·2	3·0	1·9	2·6	0·6	3·5	0·6	1·8	0·4	2·0	1·[illegible]

...rteen Februarys in London.

...her at 9 a.m.			Notations of Day's Weather.					
m.	f.	r.	b.	c.	o.	m.	f.	lt.
10	1	3	1	17	10	4	—	—
4	2	1	—	18	10	7	3	—
8	6	1	3	12	13	11	4	—
5	—	5	—	15	14	5	3	—
10	—	3	2	8	18	7	1	—
1	2	6	1	12	15	5	2	—
1	—	2	1	11	16	2	—	1
1	—	1	3	18	8	—	—	—
3	—	2	2	12	14	2	—	—
2	1	5	1	8	19	1	—	1
4	—	3	—	8	20	—	1	—
1	2	3	1	12	16	2	—	—
2	—	5	—	3	25	—	4	—
4	1	3	1	12	15	4	1	—

...ean force (by Scale 0 to 12).

...W.	SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms.	Resultant.	
F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
1·0	3	2·0	3	4·0	2	1·5	1	4·0	2	2·0	1	3·0	—	S 57° W	0·7
—	2	3·5	—	—	3	3·7	2	3·5	1	1·0	2	4·0	1	N 81 E	0·7
5·0	6	3·0	1	2·0	5	2·6	2	3.0	2	1·5	—	—	2	S 70 W	1·0
9·0	5	4·6	2	2·0	2	3·0	1	2·0	—	—	1	2·0	—	N 87 W	0·4
4·0	3	4·0	4	3·7	6	4·3	—	—	2	4·5	—	—	—	S 81 W	1·5
3·0	9	4·6	2	2·0	7	3·6	1	3·0	1	1·0	—	—	—	S 68 W	2·5
3·0	3	2·3	4	5·0	11	2·9	—	—	—	—	—	—	—	S 70 W	2·0
—	6	3·2	4	4·8	18	2·8	—	—	—	—	—	—	—	S 78 W	2·9
—	1	9·0	13	3·8	8	5·3	1	7·0	1	3·0	—	—	—	N 80 W	3·5
3·7	1	2·0	2	3·0	4	3·0	—	—	—	—	1	6·0	1	S 41 E	0·6
3·5	1	4·0	7	4·6	11	3.6	1	2·0	—	—	—	—	—	S 75 W	2·3
2·5	6	2·8	6	3·2	2	2·5	1	1.0	—	—	—	—	2	S 52 W	1·3
3·0	—	—	1	3·0	2	2·5	1	1·0	1	1·0	—	—	5	N 20 E	1·1
3·4	3·5	3·6	3·8	3·8	6·2	3·3	0·8	3·0	0·8	2·2	0·4	3·8	0·8	S 74 W	1·3

but the day has lengthened to 9h. 55m. in the middle of the month. The mean of greatest heat by *day* is 45°·5, and of cold by *night* 37°, so that the mean daily range is 8°·5, and the medium temperature 41°, which is nearly the same as the 9 a.m. temperature. The mean pressure is 30 inches, with a resultant wind from W b S,¼S. The rainfall averages 1·51 inches on 15 days, including snow on 3 days. On an average there are 15 overcast days, 12 fine, and 1 very fine day. Fog and mist are not so frequent as in December and January; mist may be reckoned for 4 days, fog for 1 day.

The maximum pressure was in 1863, with normal winds and temperature, fine, but hazy, weather, and very deficient rainfall.

The minimum pressure was in 1866, with prevalent WSW winds, none from the East, normal temperature, the maximum amount and frequency of rain.

The maximum temperature was in 1869, with normal pressure, almost constant westerly winds, and rainfall above the average. The temperature was also high in 1867, with pressure a little above the mean, prevalent WSW winds, and normal rain and weather. These high temperatures appear to be related to the constancy of the westerly winds.

The minimum temperature was in 1873, 6° below the average, with pressure above the average, predominant NE winds, snow on 7 days, and excessive overcast weather. February 1864 was very cold, with pressure at *par*, polar and equatorial winds almost equally frequent, snow on 11 days, the greatest frequency of downfall, though the amount was below the average. February 1870 was also cold, with pressure and rainfall a little below the means, but there was snow on 7 days, and the resultant wind was SE. February 1865 was likewise cold, and had snow on 6 days. Thus all the cold months are characterised by snowy weather.

The minimum rainfall occurred in 1862, with easterly winds, fine weather, temperature at *par*, pressure above the mean.

The finest weather was in 1868, with deficient rainfall, no snow, temperature 3° above the average, pressure above the average, prevalent winds from W b S, no east wind at all. These facts appear discordant with common notions of wet with the west wind; but, probably, the influence of the polar current, either in alternation or as an upper current, is necessary for the effectual condensation of the moisture.

The weather of February is usually an improvement upon January; though the variability is just as great. The mean pressure has been as high as 30·326 inches, and as low as 29·726 inches; the mean temperature up to 45°·6, and down to 34°·3; the rainfall as much as 4·05 inches on 19 days, and as little as 0·37 inch on 9 days; the resultant wind has reached W b N, force 3·5, and the E wind has had a predominant force of 0·7. Six Februarys were without snow, one had snow on 11 days; one had 25 overcast days, one had only 8. On the whole the air is clearer than in January.

Remarks on the Winter.—The mean temperature of February is the same as that of December, that of January is 2°·5 lower. The mean winter temperature is 40°; the mean daily range 8°·5. The mean temperature of

each of these months varies from year to year to the extent of 10° or 18°. The mean monthly temperature in winter may be as high as 46°·4, and as low as 33°·6; and if this is considered in connection with the statement of Dr. Scoresby-Jackson that, "Care ought to be taken to avoid exposure to the direct influence of the weather when the mean temperature sinks below 39° in winter, or rises above 57° in summer," the bearing of this matter upon the public health and mortality becomes evident. It usually happens that when the temperature of one month is unduly high that of the next is low, and *vice versâ;* attention to this may afford a useful indication to the proximate temperature of the month entered upon. The mean winter pressure is 29·95 inches of mercury, but this may range to the extent of 0·75 inch in relation to the quantity of rain which falls. The average rainfall is 6·06 inches on 47 days, including snow on 7. Spells of wind from the polar side are not uncommon, but the resultant wind is from WSW; in January it is more southerly, and in December and February rather more westerly. The frequency of the winds in winter are N, 7; NE, 8; E, 9; SE, 8; S, 7; SW, 21; W, 26; NW, 4; calm, 6;—or polar, 27; equatorial, 58.

At the low temperature of winter only a small quantity of vapour can be held in solution by the air, consequently there is a disposition to mist and fog; but February is not nearly so subject to these as December and January. If we are not, as Howard states, "now wholly exempt from thunderstorms," they are rare indeed. Taking this season at 90 days, leaving out leap-day, it has, on the average, only 2 very fine days, 33 fine (detached clouds), 55 overcast. Luke Howard usefully remarks, "from the uncertain occurrence of really dangerous weather in our winters, it is probable that the people make less of the needful provision of clothing, use less foresight in their movements, and in effect suffer more in proportion from the cold, than the inhabitants of higher latitudes."

DISCUSSION.

Mr. Park Harrison asked if Mr. Strachan had found a progressive difference in his results in successive years; or whether maxima and minima occurred without any indication of periodic action?

Mr. Dines asked that the exact position of the instruments with reference to surrounding objects might be given. He had lately been comparing many Journals together for his Rainfall Table, and such information would have been most valuable.

Mr. Symons would endorse what Mr. Dines had said respecting the desirability of the exact position of the instruments being described. Last week he saw for sale, in a country bookseller's catalogue, a series of MS. observations from 1771 to 1813, forming three thick quarto volumes; thinking it very desirable that it should be preserved, he ordered it, but when he came to examine it carefully, there was no entry where, or by whom, the observations were made. He had been able to determine the former point approximately from internal evidence, but the case strikingly illustrated the carelessness of some persons in this respect.

Mr. Strachan replied that one of his objects in working up the observations for so many years was to try and trace out any apparent coincidence with the solar-spot cycle with respect to each meteorological element, as well as any law of sequence which their maxima and minima might obey. For this purpose, he had plotted the several monthly values on squared paper. He had not perceived,

however, any indications of a cycle. As regards the exposure of the instruments that had been described in the former paper (pp. 129-130). He did not contend that the rainfall and temperature observations were entirely satisfactory. The character of the exposure was against that; but as the results gave their own averages for comparisons, there was nothing in the character of the observations to depreciate the conclusions drawn from the tabular results. The tables were computed merely to satisfy his own curiosity, without any intention of communicating them to the Society; when, however, he came to study their results, he thought that others might be interested with them besides himself, and he hoped that he would not be mistaken in that idea.

XIX. *On a New Deep Sea and Recording Thermometer.* By H. Negretti, F.M.S., and J. W. Zambra, F.M.S.

[Received April 13th.—Read May 20th, 1874.]

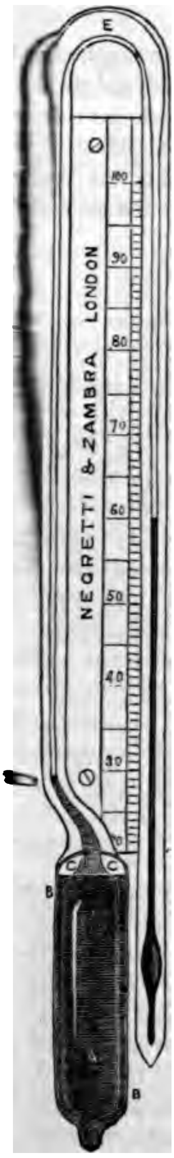
The origin of this new thermometer is due to two distinct causes:—

First.—From the fact that an old thermometer, invented by us in 1857, was reduced in size and brought out as a new instrument, with all the prestige of a paper being read upon it before the Royal Society; and

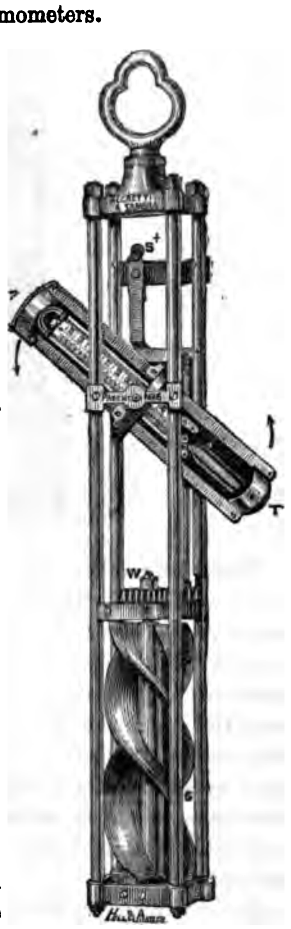
Secondly.—By our having read, in Professor Wyville Thompson's 'Depths of the Sea,' the following sentence:—"I ought to mention that in taking the bottom temperature with Sixe's thermometer, the instrument simply indicates the lowest temperature to which it has been subjected, and not necessarily that of the bottom itself." This is perfectly true; and we contend that although the readings of the Sixe's thermometer are now checked by what are termed "serial" temperatures, that is, by having a number of thermometers attached to a line, at intervals of 50 or 100 fathoms from each other, such readings cannot be entirely depended upon, and there ought to be some more definite and independent method of obtaining exact and strictly reliable (not approximate) temperature, 100 or even 50 fathoms being too wide a margin for accurate mapping of ocean temperature, when it is sought by such mappings to indicate and determine ocean currents and other important facts. The Sixe's thermometer is also liable to errors which, probably, none but the makers of the instruments are aware of.

A Sixe's thermometer may be packed and sent to its destination, and may be received apparently in perfect order, and yet it may have acquired in transit 10°, 20° or even 50° of error;—caused by the alcohol passing by the mercury either from the left-hand tube or from the right-hand one, thereby displacing the indicating column of mercury to the extent above quoted; or the error may be only a few degrees, and this without showing any trace of the instrument having met with any mishap. To this source of inaccuracy we attribute some extraordinary readings obtained in some recent soundings taken, where the temperature was found to be 22°. The liability of the indices of the Sixe's thermometer slipping or sticking is well known; and we also suggest the probability of the indices being displaced, and thereby showing a greater degree of cold from the friction and progress of the thermometer through the water in hauling the instruments upwards. We have

all experienced the resistance of a body being dragged through the water, causing a series of jerks and jumps; these jerks are most likely to, and often will, displace the indices.



Having said this much against the Sixe's thermometer, we will now describe a thermometer which we have invented, and which, we believe, will not be liable to any errors. This thermometer, although constructed for deep-sea temperatures, will be found to be equally valuable on land; for, by the aid of very rough and inexpensive clock-work, we can obtain correct records of temperatures at any desired intervals without having cumbersome and expensive instruments, such as the thermographs at present in use, which, besides the expense of artificial light, necessitate special adaptation of buildings and some photographic skill, without taking into consideration the risk of transit of large and fragile thermometers.



Our new thermometer, arranged for deep-sea purposes, has its bulb protected on the principle invented by us in 1857, which is identical, with that of the thermometers now in use on the 'Challenger' Expedition, and described by Professor Wyville Thompson in his 'Depths of the Sea'; it is syphon shape, the bend of the syphon is slightly enlarged, to facilitate the quick transit of the mercury from one limb of the syphon to the other. The action of the thermometer is as follows:—

Near the bulb of the thermometer is a contrivance such as exists in our Patent Maximum Thermometer, which, when the instrument is in a horizontal position, suddenly cuts off communication between the bulb and the mercurial column; the thermometer, whilst in a vertical position, is, to all intents and purposes, an ordinary instrument, and may be used for ordinary observations. If fixed horizontally, it acts and indicates like our Patent Maximum Thermometer, and may be used for such a purpose; but if the thermometer be inverted, and the movement of inversion be continued until the instrument regains its natural and original position, then it becomes a recording ther-

mometer by reason of the mercury being severed at the small plug or contraction near the bulb, and, passing round the bend of the syphon, eventually falling in the descending limb of the syphon, or what may be termed the recording tube, and is there left indicating the exact temperature at the time the instrument was turned over.

It will be seen by the above description that this instrument is a simple mercurial thermometer without any admixture of alcohol or other fluid, and that it has no indices, and, consequently, is not liable to displacement or to get out of order; and when the mercury has once been transferred from one side of the syphon to the other, no amount of shaking, short of turning the thermometer over in the contrary direction, can in any way displace the mercury or alter the indications.

It will be manifest that this new instrument, adapted to clock-work, can be made available for taking observations and recording temperatures in the absence of the observer, and that without clock-work accurate readings can be recorded in the dark by merely proceeding to the thermometer-stand, giving one turn to the instrument, and hanging it up again for reading off at leisure; and the instrument is also available for taking delicate observations whilst engaged in other scientific work. The thermometer may be fixed in any spot, and by means of a string or wire the instrument can be made to take one revolution and read off at any convenient time; and it will, also, be found valuable for taking temperatures at various heights by means of small captive balloons. It would be superfluous to speculate as to the many purposes for which this thermometer may be made available; but even presuming that it is not adapted for all the purposes we have suggested, we still believe that we have constructed a valuable instrument, worthy to be placed by the side of

our Patent Maximum Thermometer, the encasing the bulbs of deep-sea thermometers, and our invention of enamelling the backs of thermometer tubes, without which some of our most delicate experiments could *never* have been performed.

DISCUSSION.

Mr. SCOTT said that extreme ingenuity had been displayed in devising this instrument, and it really appeared to be a great discovery. It had not yet been experimented with actually at sea, and that was the true test which it had to stand. He thought the alarum arrangement was very good for showing the temperature at any exact hour, say midnight, when it would be inconvenient to take an eye reading.

Mr. CASELLA said the arrangement before the meeting was very ingenious, and might possibly be also very good; but he thought this had yet to be proved by trying what difference there was between using the instrument at a depth of 15 feet and under the great pressure of several thousand fathoms. The term "double bulb" had been used in reference to this thermometer, but he, Mr. Casella, must point out that there was a great difference between it and the instrument which he had constructed for use in the deep sea. There was a difference alike in shape, size, weight, number of bends, fluids employed, and, indeed, in the entire arrangement. Messrs. Negretti and Zambra's object seems to have been to make a heavy and unwieldy instrument, whereas his own object has been to make the smallest, lightest, and most portable and compact instrument that could possibly be put together. They contrived their instrument with a view to its sinking readily; he quite avoided this, because in practical operation weights varying from 7 lbs. to several hundredweights are used to sink them.

Mr. STRACHAN said that he had seen this thermometer in various stages of development, and considered it, as now perfected, rather a triumph of patience than of genius; though, indeed, Carlyle says that genius is patience. Attempts were made to observe the temperature of the sea below the surface soon after the thermometer became a useful instrument, but up to the end of the last century the results were few and unsatisfactory. Since the invention of Sixe's thermometer the observations have been numerous and extended to very great depths; but they were reliable only for a few hundred fathoms. At greater depths the increased pressure rendered the indications of the instrument uncertain. Sir J. C. Ross, in his 'Narrative of a Voyage to the Southern Seas,' repeatedly alludes to the effect of pressure upon his deep-sea thermometers, and to his endeavours to get instruments made to stand more pressure. Nevertheless, the manner in which pressure affected Sixe's thermometer does not appear to have been understood, and, chiefly owing to the results of Ross's observation, since 1840 many scientific men have maintained that the lowest temperature of the deep-sea was 39°. In 1857, at the suggestion of Admiral FitzRoy, Messrs. Negretti and Zambra invented the double-bulb with mercury as the conducting fluid. With this instrument temperatures as low as 35° were obtained in the North Atlantic. Nevertheless, having been made so large as to be easily put out of order, and having been used without the special care which they required, these protected instruments got into disfavour. Still, there can be no reason to doubt but that, with proper handling and care, they would have given consistent and valuable results. The progress of telegraphy rendered it very desirable to know with certainty the temperature of the ocean bed. Hence, in 1868, Professor W. A. Miller produced the small Sixe's thermometer with double-bulb, using spirit as the conducting fluid. A mistake was made in calling this a new invention, since it differs from Negretti and Zambra's only in having spirit instead of mercury between the bulbs. However, great care was taken in the manufacture of this instrument by Mr. Casella. It was much smaller, had but one bend, was less liable to get out of order, and was more manageable than Sixe's thermometer as hitherto made. Moreover, each was actually tested in hydraulic pressure before leaving the maker's hands. These precautions in the manufacture, together with careful instructions given to those who were to use them, insured

the success of these instruments. The results obtained from them have completely dispelled the notion of 39° being the temperature of the sea bottom, less than 32° having been recorded. Indeed, the results from them have been exceedingly valuable. However, the use of spirit was a retrograde step, for it is very sluggish in taking temperature compared with mercury. Again, all thermometers constructed on Sixe's principle must have indices supported by hair springs. These are liable to slip down and even to be jerked up, hence their registration may at times be doubtful. It frequently happens in the progress of science that the means of making observations and experiments become so improved in refinement and accuracy of instruments and methods, that results which served the purposes of former generations are no longer satisfactory. So with deep-sea thermometers. The first rude results were improved upon by the aid of Sixe's instruments; and still more so by the contrivance of the double-bulb; and now Messrs. Negretti and Zambra propose to go a step further towards perfection; to do away with the sluggish spirit, and to get rid of the indices and the doubts they sometimes occasion. In seeking to accomplish these objects, they have invented a thermometer of an entirely novel kind, which, it is hoped, will give with accuracy the deep-sea temperature at any desired depth, while it is capable of many other uses. It should, however, be experimentally determined how far its indication is affected by pressure, say about three tons on the square inch; and it remains to be ascertained whether the turning-over action can be depended upon in deep water.

Mr. Symons thought it was a great pity, that when the small form of thermometer was brought out, the large form with protecting cylinder was not mentioned. He knew it was Admiral FitzRoy's wish that the thermometer should be large; in fact, the Admiral thought it could not be too large. He (Mr. Symons) had been using one of Negretti's new thermometers, and was very greatly pleased with the instrument. He thought it would be a great boon to observers to have a self-acting apparatus by which their dry thermometer reading could be registered to the minute in their absence and by any untrained assistant. Moreover, it would be very valuable if 24 could be arranged to give the temperature at every hour during the day and night at any moderate cost.

Mr. Park Harrison thought that the thermometer should have been tested in the sea. It would have been easy to do so in a yacht or steamboat. The mechanism which rendered it a very great gain for observers on land might, very possibly, fail under conditions like those which it was supposed would occasionally affect other deep-sea thermometers.

Mr. Zambra, in reference to some remarks made by a Fellow present, said that the thermometer supplied by them with the protected bulb was a successful instrument. The necessity of a good deep-sea thermometer having been made known to Negretti and Zambra, they invented and made one with a protected bulb: it was approved, and orders came from the Admiralty;—no report had ever reached Negretti and Zambra warranting the conclusion that these instruments were not successful. Some time afterwards specifications were sent from the Admiralty to various instrument makers to be filled in, stating the best form of deep-sea thermometers suited for use in the Navy. Negretti and Zambra told the gentleman who called upon them they believed they *had* made for the Admiralty the best form of instrument that could be supplied for the purpose, and referred to the protected-bulb thermometer already supplied. The fact of a small protected-bulb thermometer being submitted and accepted as the best form, sufficiently proves that Negretti and Zambra's thermometer was successful. The thermometers supplied by their firm were, as regards size, made to order; and had an application been made for the same instrument half the size, it could then, as now, have been supplied.

Mr. Negretti said that in deep-sea sounding he had heard, from good authority, that the friction on the rope is so great, that if a rough line were lowered to any great depth, it would be brought up perfectly smooth, as if shaved. Friction is resistance; and he contended that the resistance of the thermometer in being hauled up from a great depth, would impart to it a succession of jerks and tremulous jumps, which would, in his opinion, displace the indices of a Sixe's thermometer (and by way of illustrating his meaning, he produced one of Mr. Casella's deep-sea thermometers, which was carefully set by a magnet at 61°, and by simply giving one tap to the instrument, the index gave a reading of 60°,

being 1° colder); and when it is considered that a thermometer lowered to 2,000 or 3,000 fathoms, takes several hours in hauling up, the likelihood is that the indices are displaced many degrees, and to this we may attribute some of the extraordinary readings of 22°, which were lately obtained by the Sixe's thermometer.

XX. *On a new Mercurial Minimum and Maximum Thermometer.* By S. G. Denton, F.M.S.

[Received April 14th.—Read May 20th, 1874.]

In this thermometer both maximum and minimum registrations of temperature are obtained from one mercurial bulb. Both indices are moved by mercury pressing on their ends, and the present temperature is shown by two separate columns of mercury.

The mercurial bulb is shown on the left hand of the accompanying wood-cut, with the mercury extending up in the stem, to show the present temperature. Above this and round the bend at the top, is a dense transparent fluid extending down to and joining with the mercury on the opposite or right hand side, which also shows the temperature of the time being.

This stem dips about half-way into a chamber or cup filled with mercury, and usually called an air trap. From this chamber the tube is continued downwards and dips again about half-way into a second chamber, which is more than half filled with mercury, so that in any position and at any temperature the end cannot be exposed, but is constantly immersed in the mercury.

The upper chamber has been constructed so as to guard against any possibility of the instrument getting out of order, either in transit or otherwise. For instance, should air be forced by some act of violence from the lower chamber into the upper, it cannot possibly rise into the stem; and its presence in the upper chamber will not in the slightest affect the indications of the instrument. A little of the dense fluid is placed on the top of the mercury in the lower chamber to prevent the mercury from oxidising. The fluid in the bend of the thermometer, besides connecting the two columns of mercury, assists in aiding the free movement of the indices.

As shown in the woodcut, the thermometer is to be placed vertically, the indices being drawn down to the surface of the mercury at both sides by means of a magnet.

An increase of temperature raises the index on the left to the maximum temperature, whilst a decrease raises that on the right to the mimimum temperature, where each index is retained by means of a hair spring.

Besides the ordinary expansion and contraction of the mercury in the bulb in changes during heat and cold, a second action is obtained by means of

the air in the lower chamber being highly compressed. This is effe by having the whole thermometer immersed in an extremely cold mixt when it is finally closed, so that the elastic force of this confined air tains the mercury on the right hand side and keeps it in constant cor with the transparent fluid in the upper part of the stem.

In a Paper read before the Royal Society in 1860, a thermometer to maximum and minimum readings from one mercurial bulb is descri The maximum index in this arrangement was propelled by the mercu whilst that showing the minimum temperature was drawn back by comin contact with the capillary edge of the spirit assisted by the expansion of air in the tube, as in the ordinary Rutherford arrangement, but liable to same defects, namely, a constant tendency to evaporation and separatioı the spirit. In the present thermometer this separation, &c. is impossible both the indices are propelled by mercury, the intervening fluid being hermetically sealed against evaporation.

Besides having the indicating column of mercury as fine as the ind will admit of, the bulb is bifurcated as in Casella's sensitive minin thermometers, so that the diameter of each part is not greater than in of the most sensitive of maximum thermometers. Another great advan is that the graduations are equal, as usual in mercurial thermometers. instrument being once placed in position for use, no shifting or remova any kind to set the indices is required. In using the new thermometer hygrometer, this settled position will be found a great advantage over the principle, besides obtaining the maximum and minimum of the wet bul well as the dry bulb in employing two of these thermometers for purpose.

This thermometer has also been subjected to temperatures below zero well as exposed to considerable heat in the sun's rays, and it is believed act with equal certainty to the extreme range of cold for which mercu thermometers are employed.

The thermometer has been constructed by Mr. Casella, of Holborn Ba

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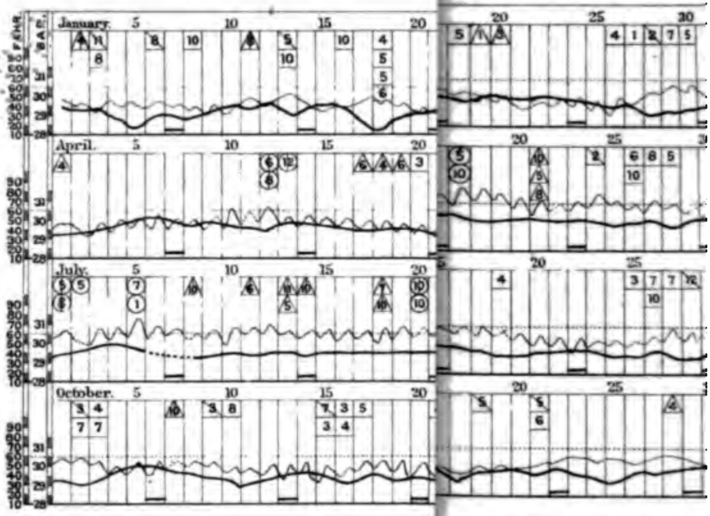
DISCUSSION.

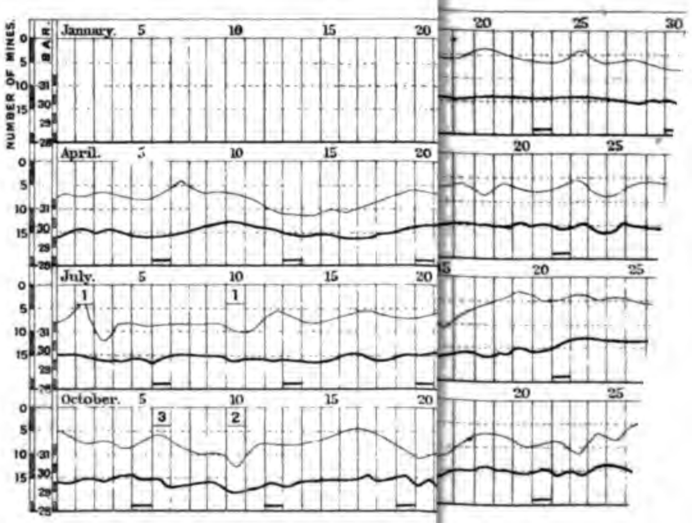
Mr. HICKS said that the maximum of this thermometer was his invention, the minimum that of M. Marchi, of the Royal Observatory, Florence. Mr. Scott given him a printed description of the Italian thermometer, and this instrum was identical in principle, with the exception that M. Marchi's worked hori tally and Mr. Denton's vertically. He felt sure that neither Mr. Denton nor Casella had seen M. Marchi's thermometer, but believed that it had merely b re-invented.

Mr. CASELLA said that, seeing the deep interest taken in registering heat cold under the same conditions, he had taken great pains in constructing instrument now before the Society. Its sensitiveness and convenience in were apparent, as the diameter of the bulb did not exceed that of a sensi standard, whilst its vertical form rendered it most convenient for Observato where, being once placed, it had not to be removed for setting the indices; the small portion of fluid in the centre, resting as it did on mercury at each would effectually prevent it from that tendency to evaporation which had found so fertile a source of trouble in most spirit minimum thermometers. sides these advantages, the graduations were equal in this, as in other merc

COLLIERY EX72.



THE BAROGRAM AT GLASGOWG DISTRICT, 1873.



thermometers; and as a registering wet and dry bulb instrument it is believed that it would be found an important addition to our present means of registering moisture. This thermometer had also been exposed to great changes of temperature, ranging from below zero, Fahrenheit, up to the full heat of the sun's rays. He was certainly not aware of the thermometer to which Mr. Hicks had referred, or he would not have patented the present instrument. It was said, however, that "there was nothing new under the sun;" and if the same principle of thermometer existed, however differing in form, he was glad thus to have it brought to his notice.

Mr. ZAMBRA said he did not see any advantage of this thermometer over Sixe's, with the bulb filled with mercury instead of alcohol; and such Sixe's thermometers had been made by his firm for Mr. Vivian, an old Fellow of the Meteorological Society.

XXI. *On the Connection between Colliery Explosions and Weather in 1872.*

By ROBERT H. SCOTT, F.R.S., Director of the Meteorological Office, and WILLIAM GALLOWAY, Inspector of Mines.

[Received May 15th—Read June 17th, 1874.]

THIS paper is in continuation of others already printed for the years 1868-70, and 1871, of which the former, that for 1868-70, appeared in the 'Proceedings of the Royal Society,' Vol. xx. No. 184, and that for 1871 in the 'Quarterly Journal of the Meteorological Society,' Vol. i. No. 8.

We are glad to say that all Her Majesty's Inspectors of Collieries, without exception, have most kindly come forward to furnish us with statistics of the accidents reported in their respective districts, and we hereby beg to tender to them our most sincere thanks.

With the fatal explosions we have included five accidents by which six men were suffocated—some by fire-damp, some by choke-damp;—two explosions, which were not immediately fatal, but caused the death of two men afterwards; and one fatal explosion in an ironstone mine. The numbers of men injured by the non-fatal explosions have not been estimated for this year, as the actual numbers have been supplied to us for two districts only. All estimated numbers are given in brackets as formerly.

Districts.	Fatal.		Non-fatal.
	Number of explosions.	Number of men killed.	Number of explosions.
South Durham	None.	None	8
North and East Lancashire, or Manchester	11	41	11
West Lancashire and North Wales	6	6	14
Midland	9	9	22
North Staffordshire, Cheshire and Shropshire	12	28	25
South-Western (Monmouthshire, &c.)	6	6	15
South Staffordshire and Worcestershire	3	3	20
South Wales	5	15	23
Northumberland, North Durham and Cumberland	2	3	4
Yorkshire	10	46	21
East of Scotland	3	3	(19)
West of Scotland	3	3	42
	70	163	(224)

Only four men are reported to have been injured non-fatally by the fatal explosions. The total number of explosions during 1872 is, therefore (294), by which 163 men were killed. As compared with the data of the preceding year, the number of explosions is greater, and the number of men killed is much less.

Year.	Fatal.		Non-fatal.
	Number of explosions.	Number of men killed.	Number of explosions.
1871	52	268	(234)
1872	70	163	(224)

There were three explosions, each of which involved the loss of more than ten lives: this is the average number for twenty years.

Three explosions, involving the loss of thirty-nine lives, took place simultaneously with the firing of shots in mines in which safety lamps were used; and one, involving the loss of thirty-four lives, in a mine in which safety lamps were used and shots were fired; but the cause of the last explosion was not ascertained.

The diagrams illustrative of the coincidence between the recorded explosions and the changes of pressure and temperature will be found at Plate II. They are precisely similar to those given by us for the four previous years.*

The sudden and serious fall of the barometer accompanying the storm of January 18th produced four explosions on the 19th; while the more gradual, but in England more extensive, depression of the 24th, which has been investigated by Mr. W. Marriott in Vol. i. of the Quarterly Journal of this

**Explanation of Upper Diagram on Plate* II.—

The dark line is the curve of the barometer, the faint line that of the thermometer.

The explosions which are apparently due to a fall of the barometer are shown by squares.

The explosions which are apparently due to a rise of the thermometer are shown by circles.

The explosions which are apparently not caused by either agency are shown by triangles.

The bar across the symbol for an explosion indicates that it was fatal. Sundays are marked by a line near the base of the diagram.

The districts in which the respective explosions occurred are indicated by figures, the explanation of which is as follows:—

1. South Durham.
2. North and East Lancashire, or Manchester.
3. South-West Lancashire, and North Wales.
4. Midland.
5. North Staffordshire, Cheshire and Shropshire.
6. South-Western (Monmouthshire, &c.)
7. South Staffordshire and Worcestershire.
8. South Wales.
9. Northumberland, North Durham, and Cumberland.
10. Yorkshire.
11. East of Scotland.
12. West of Scotland.

Society, only caused four, distributed over as many successive days, thereby illustrating our remarks in our first paper ('Proceedings of the Royal Society,' Vol. xx. p. 296), that it is the first disturbance of pressure after a period of high barometrical readings which causes the most explosions.

The next important batch of accidents were those at the end of February, no less than six, (of which four on March 1st,) having accompanied the barometrical oscillations of those days.

The general disturbance of pressure on the 21st of April was followed by six explosions (two of them fatal) on the 22nd. This may, perhaps, be due to the circumstance that the atmospherical changes occurred on a Sunday, so that the workings were in an exceptionally dangerous state when they were entered next morning.

Throughout the summer a number of explosions occurred, several of which we refer to temperature, especially those in the middle of June and at the beginning as well as in the last week of July, those on the 5th and 22nd of the latter month being exceptionally noticeable on account of the great heat of the weather at the time.

The passage over these islands of an area of low pressure on the 9th and 10th of August was accompanied by three explosions on each of the two days named; but we do not hold ourselves justified in ascribing the occurrences between the 20th and 25th to meteorological conditions, inasmuch as the barometer was steady and the temperature not higher than it had been for some days previously.

The series of six explosions at the end of August is connected by us with the reduction of pressure at that time; but there is no very striking concomitance of these accidents with a barometrical fall until the 31st of October, when we have two fatal and two non-fatal occurrences.

The disturbances in pressure on November 23rd, after a long period of calm weather, produced four explosions on that day; and the same agencies caused four more before the 27th.

On December 2nd, again a Monday, after a barometrical minimum on the Sunday, we have three explosions, two of them fatal,—another instance of conditions like those of April 22nd.

The depression of December 5th, and the more serious oscillation of December 9th, produced, each of them, four explosions.

On the whole, we have on the diagram 233* explosions, 70 per cent. of them fatal, of which we consider 135, or 58 per cent., to be due to disturbances of atmospherical pressure; 39, or 16 per cent., to be attributable to excessive heat of the weather; and 59, or 25 per cent., to be without a sufficient explanation on meteorological grounds.

These figures differ slightly from those obtained in the former years, as will be seen from the following table:—

* This number differs from that (294) given on p. 195, inasmuch as the dates of the 42 and (19) non-fatal explosions in the Scotch coal fields are unknown to us, and these occurrences cannot be inserted on the diagram.

Year.	Total Number of explosions.	Percentages due to		
		Barometer.	Thermometer.	Neither.
1868-70	550	49	22	29
1871	207	55	19	26
1872	233	58	17	25

The increase in the total number of explosions in the later years is due to the fact that the returns of non-fatal explosions are fuller than was formerly the case, thanks to the kindness of H.M. Inspectors who furnish the figures.

It seems to us hardly necessary to say that we think that the connection between the explosions and meteorological agencies is fully proved by the above figures.

We have noticed that an objection has been raised to the conclusions at which we have arrived in our former papers, on the ground that a record of meteorological phenomena at a single station like Stonyhurst, cannot possibly give a correct indication of the forces which are in operation at the same time, say in Leicestershire or South Wales. It is hardly necessary to remind the Society that such an objection could never have proceeded from any one who was familiar with the character of the areas of barometrical depression, whose passage over a tract of country is shown by a dip in the continuous curve of pressure similar to those noticeable on Plate II. These areas are usually more or less circular in shape, and vary in diameter from fifty to perhaps several hundred miles; the latter dimensions having been attained by that of January 24th, 1872, as is shown by the researches of Captain Hoffmeyer.

Over the whole region covered by such a system of depression, the barometer falls more or less below its ordinary reading, according to the character of the disturbance, and according to the position of the respective station, or colliery, as the case may be, with regard to the path taken by the centre of the storm, or point of lowest pressure: the fall being necessarily greater the more central the situation of the station.

Let us suppose the whole system stationary for a moment, and that its centre is at Stonyhurst, where the barometer has fallen an inch, and that a SW storm of the force of 10 Beaufort scale is blowing. (We may say that this indicates, roughly speaking, a gradient of 0·1 in. per 50 miles.) Accordingly, the barometer at a station lying to the SE of Stonyhurst and distant 50 miles from it will have fallen 0·9 in., while at a station distant 100 miles in the same direction the fall will be 0·8 in.

If the gale be not blowing, the gradient near the centre will not be so great, and the fall at the station 100 miles off may be as much as 0·9 in. In fact, it is simply absurd to allege that the instrumental records at Stonyhurst are not, at least in nine cases out of ten, amply sufficient to indicate what is taking place, in character though not exactly in degree, at all the collieries within 100 miles of Preston.

It must be remembered, that while at the centre of such a storm the meteorological disturbance may have been such as to prevent many of the miners from going underground at all, on the outskirts of the area the reduction of pressure may have been such as to liberate a sufficiency of foul air to render the workings eminently dangerous.

In order to show that the foregoing reasoning is strictly in conformity with the facts, we here submit two charts of the course of one of the disturbances, of which the centre passed near Stonyhurst on the evening of the 10th of October. (Figs 1 and 2.)

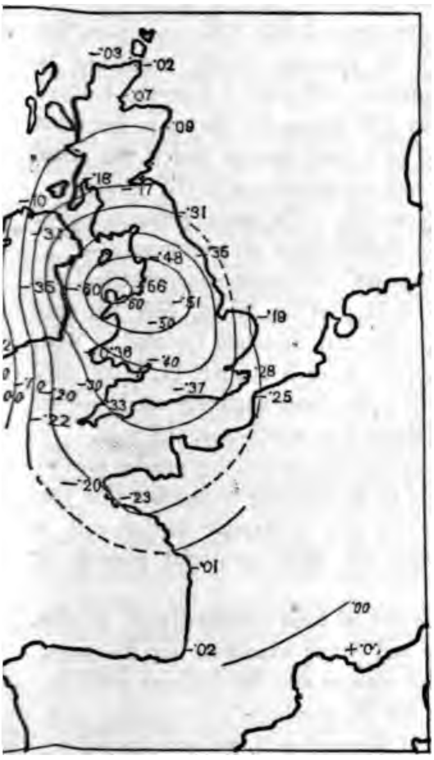


Fig. 1. 6 p.m. October 10.

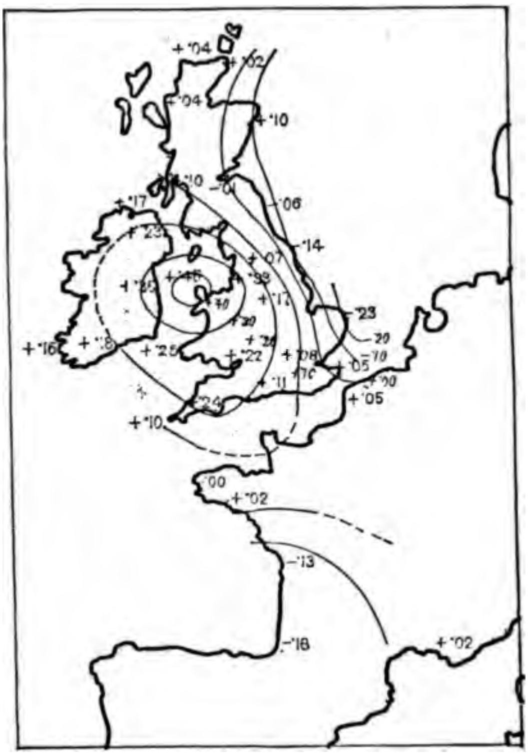


Fig. 2. 8 a.m. October 11.

In these charts, for 6 p.m. October 10th, and 8 a.m. October 11th, the curves are lines of equal change since respectively 8 a.m. on the 10th and 6 p.m. on the 10th. It will be seen that while the fall at the centre at 6 p.m. had been 0·6 in. in 10 hours, it had exceeded 0·4 in. over all the coal-fields except those in Scotland, and that of Newcastle, while, as we see from the chart for 8 a.m. 11th, the disturbance swept over the last named district during the night of the 10th.

In these charts the Arabic figures are the observed differences of readings at the several stations, marked with + or — to indicate rise or fall respectively, while the Italic figures indicate the several curves.

To this oscillation we have attributed one (non-fatal) explosion in South Wales on the 10th.

There is a very general impression abroad, to which abundant utterance was given in the evidence taken before the Parliamentary Commission in 1849, that explosions are more frequent with certain winds than with others. Thus Dr. Hutchinson says, "There has been no explosion with a north wind since 1800," and other witnesses speak to the same effect.

In all such evidence one most important element has been left out of consideration: the relative frequency of the different winds, and remarks such as that above quoted, are similar to those in the earlier Wreck Returns of the Board of Trade, where it was persistently asserted that SW winds were the most destructive winds to shipping. It is, however, hardly necessary to remind the Society that as the mean direction of the wind over the United Kingdom lies between SW and W, and as SW storms are far more frequent than those from other quarters, it would be a very strange fact if the total amount of damage to shipping did not reach a maximum with SW winds.

It is needless to deal further with generalities: the actual percentages of prevalence of wind for two stations in the British Isles are as follows:—

For Sandwick in the Orkneys, from six years' continuous anemometrical records, we find N 7, NE 6, E 15, SE 16, S 11, SW 22, W 13, NW 10, and for London from nine years' observations by Mr. Strachan (printed in Vol. IV. of the Proceedings of this Society), we have N 10, NE 11, E 12, SE 4, S 8, SW 19, W 26, NW 10, so that in both places northerly winds are in a very decided minority, compared with those from south-west and west.

It is, however, held by some authorities that the undeniably greater prevalence of explosions with southerly winds is attributable to the fact that the windrose shows a maximum of temperature and of vapour tension and a minimum of barometrical pressure when the true equatorial current is blowing.

These ideas are, however, hardly borne out, at least quantitatively, by the actual figures; for if we take the Baric and Atmic windroses for the year, and the Thermic windrose for the different seasons and for the year given by Dove and Kaemtz (Schmid, "Lehrbuch der Meteorologie") for London, as a reasonably fair indication of the climate of these islands, we have the following figures:—

Winds.		N.	NE.	E.	SE.	S.	SW.	W.	NW.
Barometer (Inches)		29·890	29·950	29·880	29·797	29·700	29·735	29·815	29·845
Vapour Tension (Inches)		0·316	0·304	0·334	0·414	0·436	0·418	0·379	0·334
Temperature	Winter ..	32°·59	32°·19	34°·60	37°·72	42°·34	41°·41	39°·73	37°·05
	Spring ..	44·20	45·02	48·50	49·42	50·90	50·35	50·09	47·37
	Summer	60·12	60·39	64·06	64·96	62·84	62·10	61·83	62·08
	Autumn	46·01	48·51	50·16	52·02	53·65	52·34	50·02	48·84
	Year	45·77	46·49	49 37	50·99	52·33	51·53	50·45	47·66

The greatest difference in barometrical pressure is only a quarter of an inch, while in vapour tension the change from NE to S is only one half that amount; while as regards temperature, the greatest contrast, between the same points of the compass, even in winter, is only ten degrees, and at other seasons is far less than that amount. It will also be noticed that in summer, when most of the explosions due to high temperature occur, the amount of difference between the temperatures for the warmest and coldest points is not as much as 5°.

The fact appears to be, that the changes which principally affect the condition of the air in a mine are the sudden oscillations which accompany the rapid variations of weather.

At the time that the evidence to which we have referred was given, more than twenty years ago, the true relation of the wind to the distribution of atmospherical pressure was not understood. We know now that all motion of the air takes place between areas of low and high pressure, termed respectively "cyclonic" and "anticyclonic." The air is either whirling into a cyclonic area, or whirling out of an anticyclonic area. We see, therefore, that according to Buys Ballot's law, a southerly wind—to take that which is generally considered to conduce more to explosions than other winds—may make its appearance either on the east side of a cyclonic area or on the west side of an anticyclonic area. In the former case, it will be accompanied by a low and falling barometer, a high temperature, and a large amount of moisture in the air; while in the latter case these several conditions will be, more or less directly, reversed.

The several secondary conditions which aid in facilitating the escape of gas from the coal, at a time when a storm is passing over the district, have been very fully described by Mr. Dobson in the paper in the "Report of the British Association," 1855, to which we referred in our first communication on the present subject. (Proceedings of the Royal Society, 1872.)

The Second General Rule of the Coal Mines Regulation Act 1872 requires that the roads and working-places of every mine in which inflammable gas has been found within the preceding twelve months shall be examined daily with a safety lamp before workmen are allowed to go to work in them, and also that the results of this examination shall be recorded in a book which shall be kept at the mine for the purpose. The Act came into operation on the 1st January 1873, and shortly afterwards the books referred to in the General Rule were introduced at the mines to which we are about to call attention. The daily report of each mine is supposed to mention whether fire-damp has or has not been found in the roads or working-places during the examination with the safety lamp; if gas has been found in one or more places, then the number and position of the places are specified; and if it has not been found in any place whatever, its absence must also be noted in the report.

The examination of the reports of any single mine, in which fire-damp is found only occasionally, appears to show that the gas comes and goes in a seemingly unaccountable manner; and when the variations of the barometer

during the period over which the report extends have been carefully studied beforehand, it is found that sometimes a sudden fall of atmospheric pressure has taken place without causing gas to appear, and sometimes gas has suddenly appeared in considerable quantity when the pressure was high and steady. If, however, the reports of a number of mines are placed side by side – so as to eliminate the influence of local causes as far as possible—and compared with the state of the atmospheric pressure during the period to which they refer, it is found that there is a remarkable correspondence between the appearance and disappearance of fire-damp and the fall and rise of the barometer.

We give a curve to illustrate this in the second diagram of Plate I.; it is constructed by means of data taken from the report books of thirty-five coal and ironstone mines in the coal measures, all situated within a distance of fifty miles from Glasgow. The dates on which fire-damp was observed in each mine during the year 1878 were tabulated; then the number of mines in which fire-damp was present on each day of the year was found. Thus it was found that fire-damp was observed in four of the thirty-five mines, and not in any of the other thirty-one, on the 17th of March; it was observed in six mines on the 18th; in six on the 19th; in four on the 20th, and so on: on no single working day throughout the year was it observed in more than fifteen or in fewer than two of the thirty-five mines. Care was taken to choose only the reports of those mines in which fire-damp appeared occasionally: we examined altogether ninety-four report books, but rejected fifty-nine of them for one or other of the following reasons, viz. fire-damp was mentioned on every working day, or it was not mentioned at all, or long periods intervened during which the mine was not at work, or the reports were irregularly and badly kept.

The curve is constructed in this way:—a distance, corresponding to the number of mines in which fire-damp is found on any particular day, is measured downwards from the middle of the top of the space representing that day, on the scale given at the left-hand side of the diagram; a series of points is thus obtained, and the curve is a bent line passing through each of these points. It is drawn across Sundays from the point of Saturday to the point of Monday.

Few of the reports contain any information before the 17th of March, and we fear that the information contained in some of them after that date is not very trustworthy. We know, for instance, of some cases in which the reports were not made for a week after the examination, and were then written up from memory; of others in which the absence of fire-damp was reported and attested by signature several days before the date of the report arrived; of others in which it was dogmatically asserted day after day that no fire-damp had been observed until an explosion occurred or another fireman was appointed: we have often seen reports that were wrongly dated, and lastly, we have seen some that continued on through fast-days and holidays to assert that *no fire-damp was observed* when the mine was not at work and no examination had been made.

It is to be hoped, however, that mistakes of this kind will soon disappear, as the men, who had not hitherto been accustomed to this kind of work, become more conversant with their duties. Some irregularities in the curve, such as those of 9th May, 2nd July, 2nd August, and 5th November, are accounted for by the fact that a number of the mines were not at work and were not examined on these dates on account of the occurrence of local holidays or fast days; it is also curious and instructive to observe that the curve descends considerably after each of these events.

A glance at the diagram is sufficient to show that notwithstanding the want of care with which many of the earlier reports were made up, the curve of fire-damp for the first five and a half months from the beginning rises and falls to a certain extent with the barometric curve; but we submit, that the correspondence between the variations of the two curves during the last four months is so unquestionably apparent, as to prove, once for all, beyond the possibility of cavil, that the variations of atmospheric pressure have a marked influence on the rate at which fire-damp escapes from the fissures.

One of us investigated officially the circumstances under which twenty non-fatal explosions and one choke-damp accident took place in mines in the neighbourhood of Glasgow during the period embraced by these curves. We have entered each accident at its proper date in the diagram, representing it as a square, with the number of men injured marked on it. Two of the accidents—7th May and 2nd November—took place on the second day after the barometer had reached its lowest point, and was again rising; thirteen took place when the barometer was falling fast, and the remaining six when the decrease of pressure was only slight.

We shall briefly discuss the circumstances under which some of them happened, and would only point the attention of the Society to the following extract from the 'Quarterly Weather Report' for 1873, at p. 25, which shows the amount of atmospherical disturbance which existed at the time of the first two accidents noted, in the very district where the barometer fell most seriously.

"June 9. The barometer, which had begun to descend briskly on the west coast of Scotland on the previous morning, now commenced a very rapid decrease, and by the morning of the 10th the conditions were those represented on Fig. 35 (Plate 33); the lowest readings lying over the Hebrides, where the mercury had fallen more than an inch in 48 hours (a most unusual extent of oscillation in the month of June.)"

(1) 9th June, 10 a.m.

Two men had begun to fill a cavity above some lofting in an aircourse: one was at work in the space A, Fig. 8; the other was at B in the aircourse. At 6 a.m. the cavity was examined with a safety lamp, and found to be free from fire-damp. Soon afterwards the men began to work, and continued till the explosion took place,

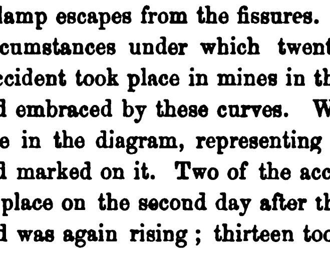


Fig. 8.

burning the one in the space A. The aircourse was about five feet wide, an the cavity which had been left by a fall of roof was of the same width at th bottom and arched towards the highest point from all sides.

(2) 10th June, 11 a.m.

The part of the shaft below the level of the workings had been covere with boards to form a seat for the cage, and water was allowed to rise to within two or three feet of this floor. A blower was known to exist in the side of the shaft below the cage-seat, and *sometimes* it made the air in the unventilated space *explosive*. On the present occasion two men were crossing the cage-seat, when the explosive mixture escaping upwards ignited at one of their lights.

(3) 6th October, 1 p.m.

Three men were clearing away a fall from an engine incline. The cavity left by the fall had been examined with a safety lamp at six o'clock in the morning, when it was found to be free from fire-damp. About one o'clock the man who was working in the cavity left it to help the others to push a loaded tub up the incline. After an absence of ten or fifteen minutes he returned, and as soon as he entered the cavity the gas ignited, burning him; the flame passed upwards, and burnt the other two men, who were at a distance of five or six yards off.

(4) 21st November, 11 a.m.

A considerable fall of roof had taken place at the point where a fault crossed a drawing road near the face of a long-wall working, and two men had been working at it for several weeks, but had not succeeded in opening up the road. The lower accessible parts of the cavity were examined with a safety lamp about six o'clock in the morning, but no trace of fire-damp was discovered. Shortly before the accident some stones began to fall, and the men retired to a short distance. A miner from a neighbouring place then went to the front of the fall, when the fire-damp, igniting at his naked light, burned all three more or less severely.

In all these instances the men were using naked lights. The first and second explosions should never have taken place, as the space in which the fire-damp accumulated could have been easily ventilated.

One inference to be drawn from a consideration of the diagrams and of many cases of explosion which have come more or less directly under our observation is this:—If fire-damp *may possibly* accumulate in any part of a space which cannot be thoroughly ventilated, then, either

(1) Workmen should not *at any time* be allowed to be near it or to enter it with naked lights; or if this rule be thought too stringent, (2) They should use only safety lamps in the space itself and in its immediate neighbourhood *during the continuance of a barometrical depression.*

It is unfortunate, that many of those who are directly responsible for the safety of the miners do not understand, and pay little or no attention to, the indications of the barometer. We admit that in some cases gas may not appear when the barometer falls—it must exude in greater quantity than usual, but it diffuses, or is carried away, before a sufficient quantity has accu-

mulated to form an explosive mixture of appreciable extent; we contend, however, that we have given sufficient evidence to show that in most cases it does appear, causing explosive accumulations to extend their boundaries, and forming explosive mixtures where they had not been seen before. It is surely not asking too much, then, when we suggest that those who are ignorant of the subject should take the trouble to acquaint themselves with Boyle and Mariotte's law of the effects of increase and decrease of pressure on gases, and with the use of the barometer; and that they should register the barometric variations so as to be in a position to know when it becomes necessary to take additional precautions.

In a former paper on this subject* we gave a diagram to show how the barometric and thermometric variations could be most conveniently and clearly exhibited; and there we mentioned that "The readings, to be of much service, must be made and recorded at intervals of not more than three or four hours during the day and night." We might have mentioned at the same time, but did not think it necessary to do so, that one barogram would be sufficient for any number of mines in the same neighbourhood, provided that information of a downward tendency of the curve could be quickly conveyed to those in charge at the mines. A barogram of this kind would be most easily and correctly made by one of the self-recording instruments now so common, such as that of Sir A. Milne.

XXII. *Solar Radiation*, 1869-1874. By the Rev. Fenwick W. Stow, M.A., F.M.S.

[Received May 20th.—Read June 17th, 1874.]

I now present to the Society the results of five years' observations of solar radiation, from May, 1869, to April, 1874, inclusive, taken by the following gentlemen, W. J. Harris, Esq., Worthing; R. C. Hankinson, Esq., Red Lodge, Southampton; Colonel Ward, Bannerdown House, Bath; Rev. C. H. Griffith, Strathfield Turgiss Rectory, Hants; G. J. Symons, Esq., Camden Square, London; Samuel H. Miller, Esq., Wisbeach; and Lancelot Turtle, Esq., Aghalee, Antrim, Ireland. The observations at these stations are complete, or nearly so. Observations extending over a shorter time have been furnished by the late F. Nunes, Esq., Chislehurst, who took great interest in this subject, and to whom I am very greatly indebted; also by Captain Chichester, Huddersfield; L. J. Crossley, Esq., Moorside, Halifax; and by myself at Hawsker, and afterwards, in conjunction with T. Wilson, Esq., at Harpenden, Herts. I desire to acknowledge my great obligations to all those who have sent me observations, and especially to Mr. Symons and Mr. Griffith. The list includes also W. B. Kesteven, Esq., Holloway; Messrs. Burrow, Great Malvern; R. C. Cann-Lippincott, Esq., Over Court, Bristol; F. E. Sawyer, Esq., Brighton; C. L. Prince, Esq., Crowborough Beacon Observatory,

* Quarterly Journal of the Meteorological Society, October, 1873.

Sussex; and J. B. Haslam, Esq., St. Andrews, Fife, who have communicated observations which have been of value to confirm those taken at neighbouring stations, but extending for the most part only over a very short period.

It will be understood that all the observations have been taken with "solar thermometers," that is, with blackened bulb maximum thermometers *in vacuo*, freely exposed to sun and air at the height of at least 4 feet. Little or no value is to be attached to the actual readings of these thermometers taken alone. No thermometer when placed in the sun's rays shows the temperature of any other object correctly, and the solar thermometer is not intended to do this. In this paper only the *amount of solar radiation*, that is, the excess of the reading of a solar thermometer above that of an ordinary maximum thermometer placed in a double louvred screen, is dealt with. To have quoted the actual readings would only have occupied valuable space. I may mention, however, that the solar thermometer, when freely exposed, seldom reads above 140° in this country; and 154° is, I think, the highest temperature registered in the five years.

The instruments used by my observers have all been compared directly or indirectly with the original instrument (the first made with the stem blackened), which I use as a standard. The comparison is made by exposing the instruments to be compared to the sun's rays for a few weeks side by side, and noting the readings both on cloudless and other days. The following are the corrections thus obtained, with the names of the stations and observers:—

Station.	Observer.	Correction in sun's rays when S. Rad. = 50°
Worthing	W. J. Harris, Esq.	+0°·7
Southampton	R. C. Hankinson, Esq.	0°·0
Bath	Colonel Ward	—1°·2 to September 1871 +1°·0 from October 1871
Strathfield Turgiss	Rev. C. H. Griffith	+0°·8 to June 1873 0°·0 from July 1873
Camden Square	G. J. Symons, Esq.	+1°·0
Wisbeach	S. H. Miller, Esq.	+2°·0
Aghalee	L. Turtle, Esq.	+1°·0
Halifax	L. J. Crossley, Esq.	+0°·8
Huddersfield	Captain Chichester	—0°·8
Hawsker & Harpenden	Rev. F. W. Stow	0°·0
Chislehurst	F. Nunes, Esq.	—4°·5

The last correction seemed suspiciously large, and on an examination of the instrument it was found to possess an *index*-error of from 2° to 4° at different temperatures, according to the length of the separating air-speck. The tube, moreover, was uneven in bore, and the instrument altogether faulty. It is therefore unfortunately necessary to reject the observations so carefully made by the late Mr. Nunes, although the corrected results seemed likely enough to be correct.

Further corrections have been applied to the earlier observations at Strath-

field Turgiss, Camden Square, and Hawsker, in order to assimilate the readings of the shade thermometer on the particular stand used with those obtained at the other stations by the use of a louvre-board screen. These corrections have been obtained partly from the Strathfield Turgiss experiments, partly from some of my own, and from Mr. Symons'. A different correction is required for each month. An open stand is now used at only one station.

In dealing with the observations made, it seemed desirable to obtain figures to express the amount of radiation uninfluenced by the occurrence of cloudy days, which affects the mean of *all* the daily maxima in the sun.

The mean of the ten greatest amounts of radiation in each month has therefore been taken. It sometimes happens that the sun does not shine out fully on as many as ten days in the month, but usually this gives the desired measure of radiation on clear and bright days; while by comparing it with the mean of all daily amounts of radiation, we get a measure of the prevalence of sunshine during the month. It is hoped that the care which has been taken in working out and correcting the results of the observations, has secured that the amount of radiation at each station shall be pretty exactly comparable with that at any other, that is to say, to within 1°, or some 2 per cent. of the radiation.

The amounts of radiation thus obtained are given in Table I., and the departure in each month from the average for that month will be found in Table II. The vapour tension at 9 a.m. is also given, worked out by means of a sliding scale which was contrived so as to give the same results as would be obtained from Glaisher's Tables. The averages in Table II. are shown by means of curves in the diagram (p. 212), by which means the average changes in radiation throughout the year at the seven principal stations can be seen at a glance.

It will be seen that radiation attains its maximum in May at every station except London. This is to be attributed to the prevalence of northerly winds, and consequent dryness of the atmosphere. December is the month of least radiation.

It will also be observed that the western stations show more radiation than the more easterly ones. The amount near Bath exceeds, slightly in summer and considerably in winter, that at Strathfield Turgiss, and that at Aghalee in the north of Ireland considerably exceeds the radiation observed at the Yorkshire stations, and at Wisbeach. Huddersfield shows the least radiation of all stations, probably owing to smoke, although on the high ground on which Mr. Crossley's observatory stands, near Halifax, sunshine is much more powerful. London air, even in the suburbs, proves, as might be expected, exceedingly impervious to the sun's rays, the amount of radiation at Camden Square being only two-thirds to seven-eighths of that at Strathfield Turgiss. The air of the fens at Wisbeach is also somewhat opaque. It appears to be very hot there in summer, and the amount of moisture is large, and it is probable that the haze and mist, which is common in low-lying districts, has exercised a very distinct effect in intercepting radiation, in addition to that of the vapour held in suspension.

TABLE I.

Year.	Month.	Worthing. Mean of 10 Maxa. of Radn.	Worthing. Departure from Average.	Worthing. Vapour Tension at 9 a.m.	Worthing. Mean Radiation, whole month.	Worthing. Departure from Average.	Southampton. Mean of 10 Maxa of Radn.	Southampton. Departure from Average.	Southampton. Vapour Tension at 9 a.m.	Southampton. Mean Radiation, whole month.	Southampton. Departure from Average.	Bath. Mean of 10 Maxa. of Radn.	Bath. Departure from Average.	Bath. Mean Radiation, whole month.	Bath. Departure from Average.	Strathfield Turgiss. Mean of 10 Maxa. of Radn.	Strathfield Turgiss. Departure from Average.	Strathfield Turgiss. Mean Vapour Tension at 9 a.m.	Strathfield Turgiss. Mean Radiation, whole month.	Strathfield Turgiss. Departure from Average.
		°	°	In.	°	°	°	°	In.	°	°	°	°	°	°	°	°	In.	°	°
1869	May	..	..	..	..	..	..	..	..	..	..	68.2	+3.0	52.9	−3.5	..	..	..	..	..
	June	..	..	..	..	..	..	..	..	..	..	65.3	+1.1	58.9	+1.6	..	..	..	..	..
	July	57.6	−1.9	.457	52.5	−1.1	..	..	..	..	..	63.3	−0.4	57.0	+1.4	..	..	..	..	..
	August	57.9	−0.2	.427	49.6	−2.3	..	..	..	..	..	61.3	+1.2	54.6	+0.5	60.1	−0.5	.413	49.8	−4.1
	September	56.2	+1.0	.425	47.0	+0.4	..	..	..	..	..	59.7	+1.3	56.3	+3.2	58.4	+1.2	.418	50.6	+2.8
	October	50.2	+1.2	.290	40.4	+3.8	..	..	..	..	..	56.1	+3.4	43.3	+3.7	49.7	+0.3	.316	40.8	+3.0
	November	..	..	..	..	..	47.6	+0.6	.265	32.9	+0.5	45.9	+1.9	30.9	+0.3	43.5	+3.0	.231	26.6	−0.2
	December	..	..	..	..	..	42.4	−0.7	.218	24.0	−0.4	40.0	+0.8	22.3	−0.1	36.0	−0.5	.196	17.3	−2.5
1870	January	..	..	..	..	..	44.7	+1.7	.199	25.7	+0.6	42.4	−0.2	[22.5]	−3.2	30.9	−7.0	.203	18.9	+2.8
	February	..	..	..	..	..	48.5	−3.4	.175	30.6	−2.3	56.5	+4.4	35.6	+1.8	49.9	+2.5	.204	33.2	+4.3
	March	60.5	+5.0	.201	46.1	+1.7	61.9	+2.6	.199	44.5	−2.4	65.0	+6.1	50.0	+5.6	61.1	+5.5	.203	45.5	+1.3
	April	59.2	−0.9	.260	50.5	+0.8	64.1	+1.5	.233	54.5	+0.4	63.1	+0.1	57.6	+3.8	58.0	−1.4	.256	52.1	+0.7
	May	60.5	−1.4	.306	54.4	−0.2	63.7	−0.1	.287	57.0	+0.8	66.6	+1.4	60.5	+4.1	65.2	+0.2	.305	55.3	−1.6
	June	57.2	−3.9	.391	51.8	−2.1	66.1	+2.7	.344	61.1	+5.9	65.2	+1.0	59.2	+1.9	62.2	−2.0	.376	55.6	0.0
	July	57.8	−1.7	.475	50.0	−3.6	63.0	−0.2	.403	53.3	−2.3	60.4	−2.9	53.3	−2.3	61.9	−1.3	.397	52.6	−3.6
	August	57.1	1.0	.420	52.5	+0.6	63.5	+1.7	.354	54.4	+1.2	60.5	+0.4	55.1	+1.0	61.4	+0.8	.369	54.4	+0.5
	September	54.0	−1.2	.491	46.5	−0.1	60.9	+1.4	.322	53.0	+3.1	60.2	+1.8	51.3	−1.8	56.9	−0.3	.386 ?	45.6	−2.2
	October	48.4	−0.6	.328	36.2	−0.4	53.0	−0.5	.298	42.4	+1.2	51.0	−1.7	42.0	+2.4	47.8	−1.6	.307	36.4	−1.4
	November	..	..	..	..	..	49.6	+2.6	.218	38.9	+6.5	44.5	+0.5	34.0	+3.4	43.3	+2.8	.219	30.3	+3.5
	December	..	..	..	..	..	44.6	+1.5	..	24.9	+0.5	44.0	+4.8	27.0	+4.6	37.9	+1.4	.157	19.7	−0.1
1871	January	..	..	..	..	..	40.1	−2.9	..	21.7	−3.4	43.9	+1.3	25.4	−0.3	36.8	−1.1	.174	19.3	−2.4
	February	..	..	..	..	..	52.4	+0.5	..	35.6	+2.7	51.5	−0.6	37.2	+3.4	46.7	−0.7	.241	29.4	+0.5
	March	54.4	−1.1	.249	44.2	−0.2	59.7	+0.4	.225	51.4	+4.5	59.2	+0.3	50.0	+5.6	56.0	+0.4	.237	47.7	+3.5
	April	62.1	+2.0	.289	48.7	−1.0	62.9	+0.3	.263	53.9	−0.2	64.3	+1.3	56.0	−2.2	58.9	−0.5	.282	50.0	−1.4
	May	63.2	+1.3	.282	55.2	+0.6	63.6	−0.2	.266	55.7	−0.5	63.3	−1.9	55.7	−0.7	65.9	+0.9	.282	57.5	+0.6
	June	63.1	+2.0	.348	56.0	+2.1	61.2	−2.2	.310	50.9	−4.3	64.0	−0.2	57.7	+0.4	64.8	+0.6	.356	53.9	−1.7
	July	61.1	+1.6	.437	55.5	+1.9	63.0	−0.2	.423	56.1	+0.5	62.4	−0.9	56.4	+0.8	62.8	−0.4	.423	55.6	−0.6
	August	57.1	−1.0	.418	51.6	−0.3	60.4	−1.4	..	52.8	−0.4	58.7	−1.4	53.4	−0.7	58.8	−1.8	.457	53.2	−0.7
	September	55.4	+0.2	.391	46.0	−0.6	58.2	−1.3	.351	46.1	−3.8	..	.	..		56.0	−1.2	.351	45.8	−2.0
	October	50.9	+1.9	.331	38.5	+1.9	54.2	+0.7	.322	41.9	+0.7	49.6	−3.1	36.5	−3.1	52.6	+3.2	.328	39.2	+1.4

Year.	Month.	London.										Aghalee.								
		Mean of 10 Maxa. of Radn.	Departure from Average.	Mean Vapour Tension at 9 a.m.	Mean Radiation, whole month.	Departure from Average.	Mean of 10 Maxa. of Radn.	Departure from Average.	Mean Vapour Tension, at 9 a.m.	Mean Radiation, whole month.	Departure from Average.	Mean of 10 Maxa. of Radn.	Departure from Average.	Mean Vapour Tension at 9 a.m.	Mean Radiation, whole month.	Departure from Average.	Mean of 10 Maxa. of Radn.	Mean Radiation, whole month.	Mean of 10 Maxa. of Radn.	Mean Radiation, whole month.
		°	°	In.	°	°	°	°	In.	°	°	°	°	In.	°	°	°	°	°	°
1869	May	57·2	+1·2	·304	44·5	−2·9	56·3	−2·1	·313	43·2	−7·0	..	..	..	..	..	61·2	49·4	..	..
	June	57·6	+1·2	·346	50·2	+2·3	53·9	−1·7	·374	49·5	+0·2	..	..	..	..	..	62·3	55·3	..	..
	July	51·6	−2·4	·453	47·4	0·0	52·3	−2·8	·482	45·3	−3·6	..	..	..	..	..	58·7	54·5	..	..
	August ..	51·9	−1·3	·394	43·4	−2·5	51·1	−4·0	·453	43·5	−5·4	..	..	..	..	..	55·0 ?	45·2 ?	..	..
	September	48·8	−1·8	·393	40·2	−0·4	50·0	−2·3	·397	43·8	1·8	..	..	..	..	..	52·4 ?	44·6 ?	..	..
	October ..	44·3	+3·5	·301	31·6	+4·3	45·5	−2·1	·311	38·4	+3·9	48·9	−1·5	·329	38·5	+0·9	45·3	33·8	..	..
	November	33·3	+1·1	·253	19·3	+0·3	36·5	−4·1	·231	23·5	−2·8	44·0	+0·4	·253	30·4	+1·1	39·6	25·0	..	..
	December	26·0	+2·2	·211	12·3	+0·7	33·9	−0·6	·189	21·0	+1·2	40·0	+2·6	·197	23·5	+3·0	37·3	17·8	..	..
1870	January ..	25·7	−0·4	·208	13·4	−0·7	35·5	0·4	·190	21·5	−0·1	41·2	+1·0	·216	27·8	+3·5	38·0	22·9	..	..
	February..	39·2	+1·4	·195	22·7	+2·5	47·2	+2·4	·180	29·5	+2·8	48·0	−0·5	·199	31·1	−1·6	45·9	29·6	..	..
	March	48·6	+3·1	·207	33·8	+2·0	49·9	−2·4	·203	34·0	−6·9	55·4	−1·1	·221	43·7	+1·4	55·7	38·5	..	..
	April	53·6	+1·7	·254	46·1	+3·4	49·8	−5·4	·277	45·2	−3·2	58·9	−2·9	·281	47·3	−3·4	60·6	51·9	..	..
	May	55·8	−0·2	·309	48·1	+0·7	55·9	−2·5	·329	50·3	+0·1	60·3	−4·7	·336	47·1	−7·8	62·0	54·0	..	..
	June	54·7	−1·7	·375	48·4	+0·5	53·5	−2·1	·404	46·1	−3·2	62·5	−1·3	·403	52·3	−0·1	62·7	54·3	..	..
	July	53·9	−0·1	·421	43·9	−3·5	51·5	−3·6	·495	44·4	−4·5	62·1	−1·7	·448	49·0	−4·7	62·7	52·7	..	..
	August	54·8	+1·6	·418	48·7	+2·8	55·4	+0·3	·448	48·7	−0·2	58·2	−1·6	·405	49·8	−0·6	59·0	52·0	..	..
	September	49·8	−0·8	·381	39·1	−1·5	51·5	−0·8	·382	45·3	−0·3	56·6	−1·6	·389	45·4	+1·3	53·1	46·8	..	..
	October ..	41·3	+0·5	·322	28·8	+1·5	49·2	+1·6	·317	28·6	−5·9	50·3	−0·1	·300	35·9	−1·7	47·6	32·0	..	..
	November	30·1	−2·1	·231	18·7	−0·3	40·9	+0·3	·222	27·3	+1·0	43·5	−0·1	·245	31·5	+2·2	43·4	28·6	..	..
	December	26·0	+2·2	·175	13·0	+1·4	38·9	+4·4	·159	20·6	+0·8	39·5	+2·1	·177	20·4	−0·1	45·6	22·1	..	..
1871	January	23·6	−0·2	·178	11·9	−2·2	37·6	+1·7	·149	21·2	−0·4	38·2	−2·0	·197	30·1	+6·2	48·8	26·8	41·8	22·9
	February.	37·8	0·0	·240	22·4	+2·2	41·6	−3·2	·240	25·5	−1·2	45·1	−3·4	·261	28·1	−4·6	51·6	34·6	42·0	27·6
	March	45·6	+0·1	·244	30·3	−1·5	49·1	−3·2	·247	45·3	+4·5	52·4	−4·1	·246	38·5	−3·8	54·5	44·0	57·5	44·0
	April	52·2	+0·3	·280	41·3	−1·4	54·4	−0·8	·283	45·7	−2·7	62·7	+0·9	·275	46·5	−4·2	60·2	43·3	62·0	46·3
	May	54·7	−1·3	·298	47·6	+0·2	58·7	+0·3	·305	51·4	+1·2	66·1	+1·1	·373	57·5	+2·6	61·4	53·4	62·4	52·7
	June	57·1	+0·7	·372	46·9	−1·0	57·3	+1·7	·375	48·0	−1·3	64·5	+0·7	·361	47·5	−4·9	64·7	51·7	66·3*	56·3*
	July	53·8	−0·2	·404	47·5	+0·1	57·1	+2·0	·449	51·0	+2·1	65·1	+1·3	·415	55·2	+1·5	60·7	53·3	64·0	54·6
	August ..	50·7	−2·5	·456	43·5	−2·4	56·5	+1·4	·487	52·8	+3·9	60·9	+1·1	·434	49·5	−0·9	59·2	50·3	61·4	50·5
	September	49·7	0·9	·375	37·2	−3·4	54·9	+2·6	·374	44·3	−1·3	56·9	−1·3	·356	35·1	−9·0	52·9	38·6	61·4	46·0
	October	40·5	−0·3	·311	25·3	−2·0	49·3	+1·7	·321	35·9	+1·4	49·1	−1·3	·319	37·5	−0·1	..	..	51·1	36·2
	November	33·2	+1·0	·189	20·2	+1·2	42·5	+1·9	·185	29·2	+2·9	44·2	+0·6	·223	29·5	+0·2	..	..	44·0	25·4
	December	25·3	+1·5	·211	12·4	+0·8	36·0	+1·5	·198	20·4	+0·6	38·0	+0·6	·221	20·5	0·0	..	..	33·2	20·5

* Part of Month.

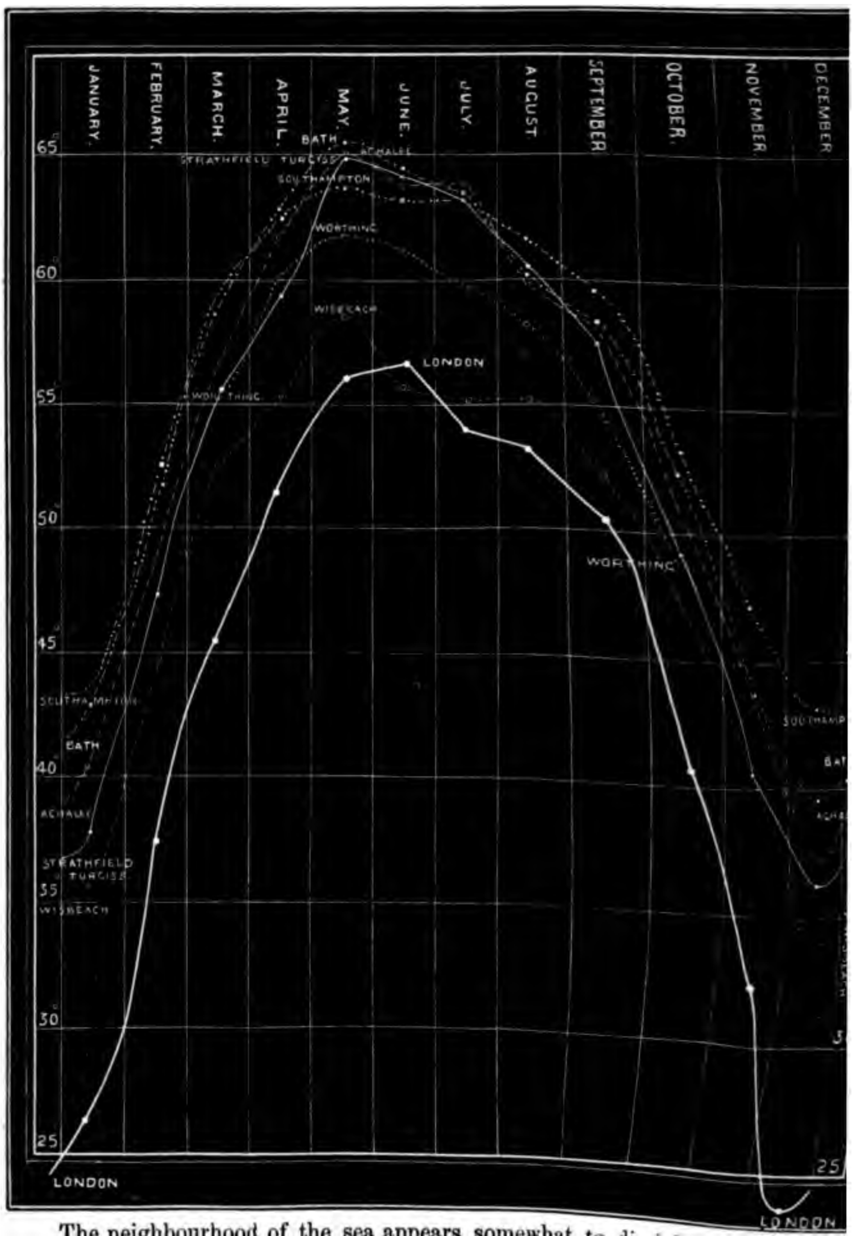
TABLE I.—*Continued.*

Year.	Month.	Worthing.					Southampton.					Bath.				Strathfield Turgiss.				
		Mean of 10 Max^a. of Rad^n.	Departure from Average.	Mean Vapour Tension at 9 a.m.	Mean Radiation, whole month.	Departure from Average.	Mean of 10 Max^a. of Rad^n.	Departure from Average.	Mean Vapour Tension at 9 a.m.	Mean Radiation, whole month.	Departure from Average.	Mean of 10 Max^a. of Rad^n.	Departure from Average.	Mean Radiation, whole month.	Departure from Average.	Mean of 10 Max^a. of Rad^n.	Departure from Average.	Mean Vapour Tension at 9 a.m.	Mean Radiation, whole month.	Departure from Average.
		°	°	In.	°	°	°	°	In.	°	°	°	°	°	°	°	°	In.	°	°
1872	January ..	..	..	..	..	..	43.1	+0.1	.226	29.0	+3.9	40.0	—2.6	27.0	+1.3	40.7	+2.8	.217	24.9	+3.2
	February	..	..	..	..	..	53.6	+1.7	.227	38.7	+5.8	54.0	+1.9	37.5	+3.7	51.3	+3.9	.269	33.9	+5.0
	March ..	55.8	+0.3	.258	46.3	+1.9	58.2	—1.1	—	44.5	—2.4	58.0	—0.9	44.5	+0.1	55.8	+0.2	.227	44.0	—0.2
	April	61.0	+0.9	.272	52.5	+2.8	62.0	—0.6	.255	54.6	+0.5	63.0	0.0	54.5	+0.7	60.8	+1.4	.268	53.8	+2.4
	May......	61.7	—0.2	.308	53.7	—0.9	64.0	+0.2	.276	55.0	—1.2	65.0	—0.2	57.0	+0.6	63.4	—1.6	.294	55.9	—1.0
	June	63.8	+2.7	.396	56.7	+2.8	63.0	—0.4	.393	54.0	—1.2	65.8	+1.6	57.0	—0.3	65.5	+1.3	.399	56.9	+1.3
	July	60.0	+0.5	.485	55.5	+1.9	63.6	+0.4	—	56.0	+0.4	65.0	+1.7	54.0	—1.6	64.3	+1.1	.491	58.5	+2.3
	August ..	59.7	+1.6	.434	53.8	+1.9	62.2	+0.4	.423	54.7	+1.5	61.3	+1.2	54.3	+0.2	60.9	+0.3	.470	54.5	+0.6
	September	54.4	—0.8	.408	47.4	+0.8	58.9	—0.6	.391	48.7	—1.2	59.8	+1.4	51.0	—2.1	55.7	—1.5	405	48.1	+0.3
	October ..	48.7	—0.3	.326	33.1	—3.5	53.4	—0.1	.309	39.5	—1.7	53.8	+1.1	41.6	+2.0	47.6	—1.8	.310	36.6	—1.2
	November	..	..	..	..	..	46.8	—0.2	—	32.5	+0.1	44.7	+0.7	32.2	+1.6	40.1	—0.4	.266	28.6	+1.8
	December	..	..	..	..	..	40.8	—2.3	.267	23.5	—0.9	37.0	—2.2	21.0	—1.4	36.1	—0.4	.243	20.5	+0.7
1873	January ..	..	..	..	..	..	45.0	+2.0	.240?	25.0	—0.1	44.0	+1.4	28.0	+2.3	39.2	+1.3	.233	22.6	0.9
	February*	..	..	..	..	..	50.4	—1.5	—	23.2	—9.7	46.6	—5.5	25.0	—8.8	45.0	—2.4	.188	22.3	—6.6
	March	52.6	—2.9	.245	44.0	—0.4	57.2	—2.1	.225	45.0	—1.9	53.5	—5.4	33.2	—11.2	50.3	—5.3	.216	39.5	—4.7
	April	60.2	+0.1	.250	50.2	+0.5	63.6	+0.4	.244	53.8	—0.3	62.0	—1.0	47.0	—6.8	60.4	+1.0	.242	50.8	—0.6
	May ...	62.2	+0.3	.295	55.1	+0.5	64.1	+0.3	.306	56.6	+0.4	63.2	—2.0	55.8	—0.6	65.3	+0.3	.284	59.1	+2.2
	June ..	60.3	—0.8	.408	51.0	—2.9	63.2	—0.2	.403	55.0	—0.2	61.8	—2.4	54.0	—3.3	64.3	+0.1	.390	56.0	+0.4
	July	61.2	—1.7	.454	54.4	+0.8	63.0	—0.2	.454	57.2	+1.6	66.1	+3.1	57.5	+1.9	64.0	+0.8	.445	58.2	+2.0
	August ..	58.7	+0.6	.460	52.0	+0.1	61.0	—0.8	.426	50.5	—2.7	58.8	—1.3	53.0	+1.1	61.8	+1.2	.430	57.6	+3.7
	September	56.4	+1.2	.376	46.2	—0.4	60.0	+0.5	.344	52.0	+2.1	59.0	+0.6	54.0	+0.9	58.8	+1.6	.347	49.2	+1.4
	October ..	46.6	—2.4	.336	34.6	—2.0	53.5	0.0	.313	41.0	—0.2	53.2	+0.5	34.5	—5.1	49.3	—0.1	.303	36.2	—1.6
	November	..	..	..	..	..	45.0	—2.0	.265	25.5	—6.9	41.5	—2.5	25.0	—5.6	35.8	—4.7	.241	22.3	—4.5
	December	..	..	..	..	..	43.5	+0.4	.243	22.5	—1.9	34.7	—4.5	15.3	—7.1	35.7	—0.8	.225	21.3	+1.5
1874	January ..	..	...	..	..	..	42.0	—1.1	.248	24.1	—1.0	..	..	..	..	41.9	+4.0	.231	23.0	+1.3
	February	..	..	..	..	..	54.5	+2.6	.212?	36.6	+3.7	..	..	..	..	44.0	—3.4	.213	25.8	—3.1

TABLE I.—Continued.

Year.	Month.	London. Mean of 10 Max^a. of Rad^n.	London. Departure from Average.	London. Mean Vapour Tension at 9 a.m.	London. Mean Radiation, whole month.	London. Departure from Average.	Wisbeach. Mean of 10 Max^a. of Rad^n.	Wisbeach. Departure from Average.	Wisbeach. Mean Vapour Tension at 9 a.m.	Wisbeach. Mean Radiation, whole month.	Wisbeach. Departure from Average.	Aghalee. Mean of 10 Max^a. of Rad^n.	Aghalee. Departure from Average.	Aghalee. Mean Vapour Tension at 9 a.m.	Aghalee. Mean Radiation, whole month.	Aghalee. Departure from Average.	Harpenden. Mean of 10 Max^a. of Rad^n.	Harpenden. Mean Radiation, whole month.	Halifax. Mean of 10 Max^a. of Rad^n.	Halifax. Mean Radiation, whole month.
		°	°	In	°	°	°	°	In.	°	°	°	°	In.	°	°	°	°	°	°
1872	January ..	25.5	−0.6	.233	14.0	−0.1	34.5	−1.4	.221	19.5	−2.1	40.9	+0.7	.230	23.5	−0.8	36.7	23.5	33.3	20.0
	February	37.4	−0.4	.260	22.5	+2.3	45.0	+0.2	.247	26.0	−0.7	46.5	−2.0	.248	34.4	+1.7	47.1	36.5	38.0	23.0
	March	45.0	−0.5	.249	33.0	+1.2	56.7	+4.4	.261	43.3	+2.4	54.1	−2.4	.258	40.0	−2.3	53.0	41.8	51.4	38.8
	April	50.8	−1.1	.275	44.0	+1.3	58.2	+3.0	.293	51.6	+3.2	62.3	+0.5	.274	52.9	+2.2	61.3	52.3	59.2	47.8
	May	55.5	−0.5	.304	48.0	+0.6	61.7	+3.3	.300	53.6	+3.4	66.9	+1.9	.311	57.0	+2.1	62.5†	47.9†	62.3	53.1
	June	55.3	−1.1	.380	46.5	−1.4	57.2	+1.6	.442	53.0	+3.7	63.4	−0.4	.382	53.5	+1.1	62.3†	55.1†	62.3	53.3
	July	55.0	+1.0	.454	48.0	+0.6	58.2	+3.1	.530	51.6	+2.7	65.3	+1.5	.461	56.7	+3.0	59.1	53.2	60.0	50.5
	August ..	53.6	−0.2	.424	45.5	−0.4	57.5	+2.4	.438	48.7	−0.2	59.5	−0.3	.438	51.3	+0.9	59.7	51.9	55.2	46.2
	September	51.6	+0.4	.390	43.3	+2.7	51.2	−1.1	.408	46.6	+1.0	58.3	+0.1	.390	45.3	+1.2	56.3	50.1	57.5	47.0
	October ..	37.2	−3.6	.318	25.2	−2.1	47.2	−0.4	.312	32.0	−2.5	52.1	+1.7	.292	37.3	−0.3	52.5	36.5	47.6	35.2
	November	34.5	+2.3	.262	20.9	+1.9	40.1	−0.5	.257	25.8	−0.5	43.6	0.0	.257	26.7	−2.6	42.0	28.6	39.1	24.7
	December	21.7	−2.1	.245	11.3	−0.3	30.8	−3.7	.235	18.0	−1.8	33.8	−3.6	.230	18.3	−2.2	33.8	18.4	28.2	11.0?
1873	January ..	27.5	+1.4	.232	16.2	+2.1	38.1	+2.2	.227	24.5	+2.9	40.2	0.0	.230	22.3	−2.0	38.6	24.3	30.7	16.6
	February .	40.8	+3.0	.171	17.0	+3.2	45.7	+0.9	.180	22.0	−4.7	54.0	+5.5	.196	34.5	+1.8	45.5	25.7	46.9	24.0
	March	43.5	−2.0	.229	30.5	−1.3	52.9	+0.6	.216	39.5	−1.4	57.6	+1.1	.242	42.0	−0.3	52.0	40.1	48.8	35.5
	April	52.0	+0.1	.249	41.3	−1.4	58.0	+2.8	.262	50.0	+1.6	62.4	+0.6	.271	52.4	+1.7	61.8	51.0	55.5	46.0
	May	56.8	+0.8	.285	49.0	+1.6	59.4	+1.0	.310	52.8	+2.6	66.6	+1.6	.302	58.2	+3.3	65.3	57.8	60.9	49.2
	June	57.5	+1.1	.390	47.3	−0.6	56.1	+0.5	.421	49.8	+0.5	64.7	+0.9	.408	56.0	+3.6	64.9	54.6	62.0	52.0
	July	56.2	+2.2	.426	50.4	+3.0	56.2	+1.1	.472	52.1	+3.2	62.7	−1.1	.438	54.0	+0.3	63.9	57.9	64.8	56.0
	August ..	55.5	+2.3	.438	48.5	+2.6	55.0	−0.1	.455	51.5	+2.6	60.7	+0.9	.422	51.0	+0.6	62.0	56.6	63.8	52.6
	September	53.5	+2.9	.341	43.2	+2.6	54.0	+1.7	.374	48.0	+2.4	61.2	+3.0	.356	50.5	+6.4	56.6	50.6	59.6	48.0
	October ..	40.5	−0.3	.295	25.6	−1.7	46.8	−0.8	.268	37.8	+3.3	51.8	+1.4	.293	39.0	+1.4	53.3	37.5?	46.6	35.5
	November	30.2	−2.0	.251	16.0	−3.0	43.2	+2.6	.250	25.5	−0.8	42.7	−0.9	.250	28.7	−0.6	41.4?	27.0?	36.2	19.5
	December	20.0	−3.8	—	9.1	−2.5	33.0	−1.5	.220	19.0	−0.8	35.5	−1.9	.252	20.0	−0.5	37.2?	18.0?	28.8	16.2
1874	January ..	28.4	+2.3	.238	14.3	+0.2	34.7	−1.2	..	21.4	−0.2	40.5	+0.3	.233	22.8	−1.3	41.1	27.1	43.5	21.8
	February	33.6	−4.2	.214	16.6	−3.6	44.7	−0.1	..	27.4	+0.7	48.9	+0.4	.233	35.5	+2.8	50.3	30.0	48.8	37.0
	March	44.7	−0.8	.248	31.6	−0.2	53.1	+0.8	.236	42.5	+1.6	63.2*	+6.6*	.259	47.5	+5.2	57.1	42.8	54.4	43.2
	April ..	51.1	−0.8	.287	40.7	−2.0	55.8	+0.6	.306	49.5	+1.1	62.9	+1.1	.325	54.5	+3.8	58.1	51.5	58.0	48.3

* Partly affected by snow. † Part of month.



The neighbourhood of the sea appears somewhat to diminish solar radiation, as in the case of Worthing, where there is about 5 per cent. less radiation than at Strathfield Turgiss in summer, and the amount observed at Hawsker in 1869 fell short by a similar amount of that given by observations which were taken at Ripon in that year. In 1871 the observations at Hawsker can be compared with those at Willow Hall, Halifax, with a like result. It is to be observed, however, that this does not apply to the cold period from November to April, during which season the air is generally clear on the coast, there

TABLE II.

AVERAGES FOR FIVE YEARS.

Months.	Mean of 10 greatest Amounts of Radiation in each Month.								Mean Radiation on all Days of each Month.							
	Worthing.	Southampton.	Bath.	Strathfield Turgiss.	London.	Wisbeach.	Aghalee.	Seven Stations.	Worthing.	Southampton.	Bath.	Strathfield Turgiss.	London.	Wisbeach.	Aghalee.	Seven Stations.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
January	..	43.0	42.6*	37.9	26.1	35.9	40.2	37.6	..	25.1	25.7*	21.7	14.1	21.6	24.3	22.1
February	..	51.9	52.1*	47.4	37.8	44.8	48.5	47.1	..	32.9	33.8*	28.9	20.2	26.7	32.7	29.2
March	55.5	59.3	58.9*	55.6	45.5	52.3	56.5	54.9	44.4	46.9	44.4*	44.2	31.8	40.9	42.3	42.1
April	60.1	62.6	63.0*	59.4	51.9	55.2	61.8	59.1	49.7	54.1	53.8*	51.4	42.7	48.4	50.7	50.1
May	61.9	63.8*	65.2	65.0*	56.0	58.4	65.0*	62.2	54.6	56.2*	56.4	56.9*	47.4	50.2	54.9*	53.8
June	61.1	63.4*	64.2	64.2*	56.4	55.6	63.8*	61.2	53.9	55.2*	57.3	55.6*	47.9	49.3	52.4*	53.1
July	59.5	63.2*	63.3	63.2*	54.0	55.1	63.8*	60.3	53.6	55.6*	55.6	56.2*	47.4	48.9	53.7*	53.0
August	58.1	61.8*	60.1	60.6	53.2	55.1	59.8*	58.4	51.9	53.2*	54.1	53.9	45.9	48.9	50.4*	51.2
September	55.2	59.5*	58.4	57.2	50.6	52.3	58.2*	55.9	46.6	49.9*	53.1	47.8	40.6	45.6	44.1*	46.8
October	49.0	53.5*	52.7	49.4	40.8	47.6	50.4	49.1	36.6	41.2*	39.6	37.8	27.3	34.5	37.6	36.4
November	..	47.0	44.0	40.5	32.2	40.6	43.6	41.3	..	32.4*	30.6	26.8	19.0	26.3	29.3	27.4
December	..	43.1	39.2	36.5	23.8	34.5	37.4	35.7	..	24.4	22.4	19.8	11.6	19.8	20.5	19.7

* Averages for 4 years only.

is an absence of fog and mist, and radiation is powerful. Unfortunately, the position of the instrument renders the observations at Worthing useless during the winter; but those taken at Hawsker prove this, and the radiation

at Worthing in March and April slightly exceeds that at Strathfield Turgiss. In summer, however, there is less radiation on the coast than at inland stations. Even Southampton falls below Strathfield Turgiss at that season, and it is very likely that the proximity of the sea influences the results both there and at Wisbeach. The air over the sea is for the most part heavily loaded with vapour in the summer season, and it is to this fact that I would attribute the diminution of solar radiation on the coast.

Although radiation is usually more powerful at the western stations when the sun shines out fully, there are, on the other hand, fewer days on which it shines, and generally more cloud when it does. The latter circumstance would tend to increase the amount of solar radiation by the heat reflected from the edges of the clouds which approach the sun, provided the interval of sunshine is long enough to allow the thermometer to acquire the proper temperature. The result of experiments detailed in a paper printed last year in the Society's Journal, "On Temperature in Sun and Shade," Vol. I. p. 146, was, that the amount thus received by reflection was put at one-eighth of the total radiation. But as cumuli and broken nimbus were unusually common during the month in which the experiments were carried on, it would probably be more correct to set this amount at one-tenth of the radiation on an average of spring, summer, and autumn. And if this proportion be subtracted from the mean of the ten days in each month having the greatest amounts of radiation, we get very nearly the amount which is observed on clear and cloudless days, except during the winter. (Table III.) I do not, however,

TABLE III.

Months.	Hawsker. May 1869 to September 1871.		Strathfield Turgiss. August 1869 to April 1874.		Southampton. November 1869 to April 1874.		
	9-10ths of Mean of 10 greatest amounts.	Departure of this from Calculated Radiation.	9-10ths of Mean of 10 greatest amounts.	Departure from Calculated Radiation.	Radiation due to sun's altitude at noon.	9-10ths of Mean of 10 greatest amounts.	Departure from Calculated Radiation.
	°	°	°	°	°	°	°
January	39·1*	+4·0*	34·1	−5·1	39·7	38·7	−1·0
February	43·8	−0·9	42·7	−4·3	47·3	46·6	−0·7
March	49·7	−1·7	50·1	−2·4	52·7	53·4	+0·7
April	54·4	−0·7	53·5	−2·1	55·6	56·3	+0·7
May	55·4	−1·1	58·5	+1·4	57·2	57·4	+0·2
June	56·9	−0·4	57·8	+0·2	57·7	57·1	−0·6
July	54·6	−2·4	57·0	−0·5	57·5	56·9	−0·6
August	52·0	−3·6	54·5	−1·7	56·3	55·6	−0·7
September	47·5?	−5·8	51·5	−2·7	54·3	53·5	−0·8
October	41·9	−6·0	44·5	−5·2	50·0	48·2	−1·8
November	37·4	−1·3	36·5	−5·6	42·6	42·7	+0·1
December	37·3*	+6·1*	32·9	−3·9	37·5	38·8	+1·3

* Partly affected by reflection from snow.

think that the excess of radiation at western stations is so much due to the presence of more cloud, as to the greater purity and coolness of the air and

its comparative freedom from haze. The last word suggests the inquiry what haze is; a subject to which meteorologists have devoted but little attention. Does it consist of dust and impurities, or minute particles of water floating in mid-air? or is it simply a non-transparent state of the atmosphere resulting from its being unequally heated?

It can hardly be expected that any secular change should show itself in five years. Taking the average of the seven principal stations, the following shows the seasonal and annual departures from the average (Worthing not reporting in the winter).

Year.	May to July.	August to October.	November to January.	February to April.	Year.
	°	°	°	°	°
1869-70	−0·3	+0·1	+0·1	+0·9	+0·20
1870-71	−1·2	−0·1	+1·0	−0·5	−0·20
1871-72	+0·2	−0·2	+0·5	+0·4	+0·22
1872-73	+0·8	0·0	−0·1	−0·7	0·00
1873-74	+0·3	+0·4	−1·2	−0·2	−0·18

Radiation, therefore, was decidedly in defect in the early part of the summer of 1870, and decidedly in excess in 1872; a result which seems to show that settled weather is not so favourable to powerful sunshine as its opposite. This may possibly result from the presence of a colder upper stratum of air in unsettled weather, and in part also from increased reflection from clouds. But it needs no thermometer to make one aware of the intensity of sudden gleams of sunshine in rainy weather. Radiation was in excess in the quarter ending April 1870, which was upon the whole a cold one; and in the winter of 1870-71, which was very severe. In the mild winter which we have just experienced, the defect of radiation was very marked. The autumns appear to have been very much alike in amount of radiation. Taking the whole years, each ending with April, radiation was slightly above the average in 1869-70, and as much below it in 1870-71, above it again the next year, and in 1872-73 just equal to the average, falling below it again during the year which ended with last April. The extreme change was less than half-a-degree, which occurred in consecutive years.

A few remarks may be made in conclusion on the general question of the accuracy of the mode of observation employed.

In the "Report of the Proceedings of the Meteorological Congress at Vienna," for the recognition by which body of the usefulness of these investigations and experiments I must express my gratitude, I find (p. 57) two objections made. 1. That the thermometer in the exhausted envelope is exposed to the radiation of other objects standing near and exposed to the sun, as well as to the direct rays. 2. That the air surrounding the apparatus may have a different temperature from that surrounding the thermometers in the shade.

With regard to the first objection, it must be remembered that the radiation from other bodies heated by the sun, being *obscure*, is necessarily

unable to penetrate the glass envelope, and can only heat the bulb to a small extent by first heating the external glass. Care must be taken, however, not to expose the solar thermometer near surfaces which are good reflectors, since reflected solar heat penetrates the glass with greater facility.

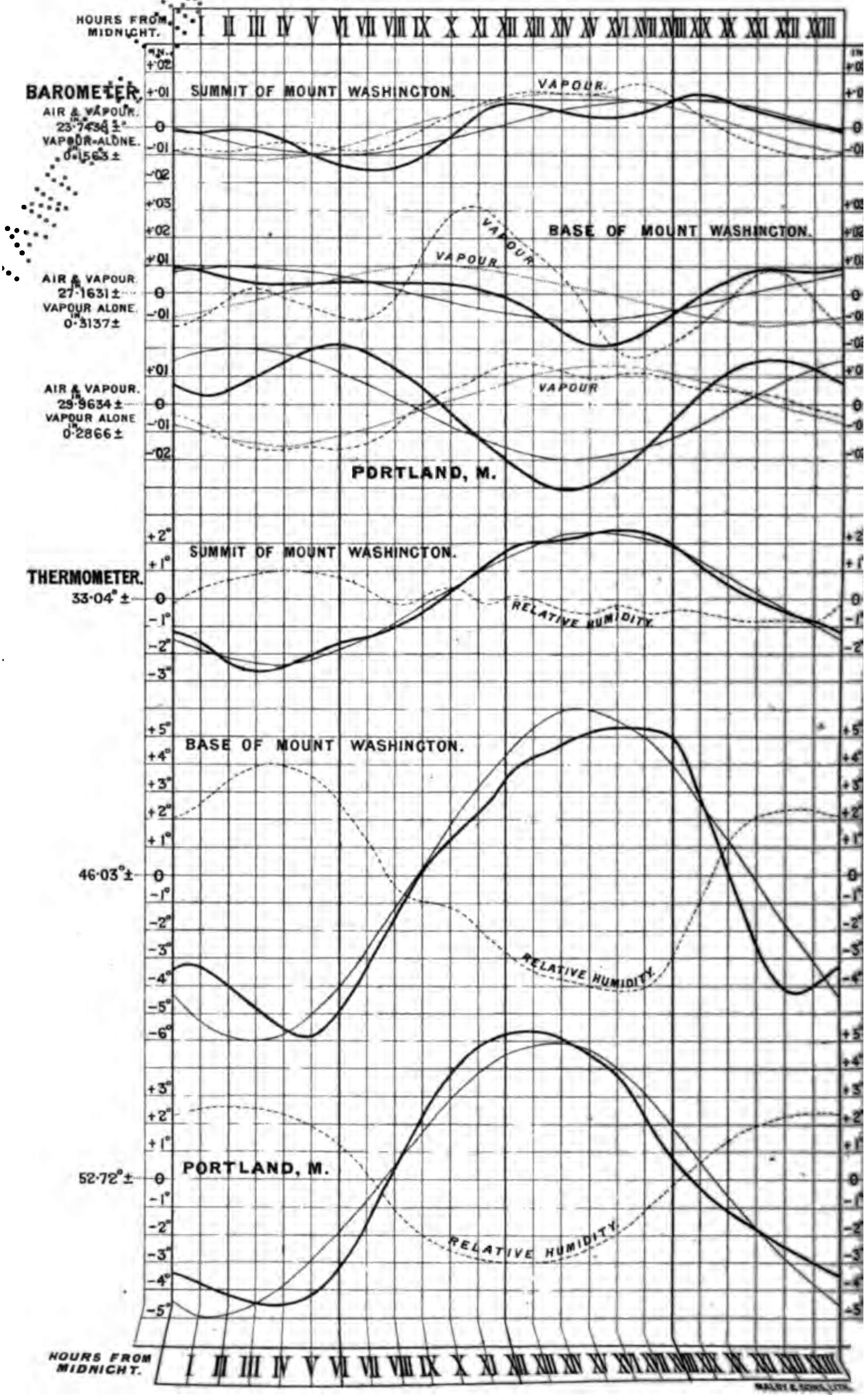
The second objection is only directed against the objectionable practice of placing the shade thermometers close to buildings or under trees. The more accurately the real temperature of the air in the open is indicated by the shade thermometers, the more exactly will they show that of the air surrounding the solar thermometer, provided that the latter is as freely exposed as it ought to be.

It may be doubted whether the solar thermometer indicates the full effect of the comparatively obscure solar rays which fail to penetrate the glass envelope. These certainly do heat the latter, and, therefore, also the bulb, to the extent of several degrees, contributing, perhaps, rather less than a tenth of the whole radiation registered. If this is too small a proportion, the instrument is so far defective; but it must be remembered that it has been tried against a Herschel's Actinometer, and gave results which were comparable within 2 per cent. with those of the latter. When a perfect Actinometer is proposed for general use by meteorologists, the blackened bulb *in vacuo* must give place to it, but in the mean time it is the best which can be used for ordinary observations.

DISCUSSION.

Mr. Park Harrison said that in 1867 he made a series of experiments on solar radiation, for the purpose of ascertaining the cause of the apparent inequalities in the sun's heat. He used a delicate thermometer with an unprotected bulb, coated with China ink, as more sensitive, and consequently better fitted to show momentary changes than one *in vacuo*. Observations were made only on perfectly calm days, as ascertained by a feather-streamer placed over the instrument. He found that light clouds near the sun very greatly increased the readings of the solar thermometer, owing to the waves which would have travelled in other directions being deflected on to the instrument *in addition* to what it received immediately from the sun. He described the screens, both closed and open, of various diameters, with which the experiments were made, and by which he satisfied himself that it was cloud and cumulus in the direction and neighbourhood of the sun alone that produced the effect above noticed. He was glad to find that Mr. Stow's results confirmed his own, that cloud near the sun increased solar radiation, which he ventured to ask the Society to accept as an ascertained meteorological fact.

HOURLY INEQUALITIES FOR MAY, 1872.



XXIII. *The Diurnal Inequalities of the Barometer and Thermometer, as illustrated by the Observations made at the summit and base of Mount Washington, N.H., during the month of May*, 1872. By W. W. Rundell, F.M.S.

[Received May 29th. Read June 17th, 1874.]

The meteorological observations made at Mount Washington, in May 1872, and recorded in General Myer's Report to the War Department of the United States, dated October 1st, 1872, will have been perused with much interest by meteorologists generally. They possess special value to those who study the diurnal inequalities of the barometer and thermometer; and I have subjected them to a somewhat careful discussion, to see what light they would throw on this difficult part of meteorology. The explanations of these phenomena which have hitherto been given have not appeared to me to be satisfactory, and the objections which were raised at a recent meeting of the Meteorological Society against the most generally received hypothesis, seem to me such as cannot easily be answered.

These inequalities have no doubt been a cause of perplexity to many observers. Some writers on meteorology have treated them as obstacles to ascertaining correctly the mean temperature or the mean pressure at a given place, rather than as matters to be carefully weighed and measured for the further advancement of their science. Perturbations and apparent irregularities in astronomical research have always been the index to new discovery, and I feel assured that these meteorological inequalities afford much scope for successful investigation. The more general application of Bessel's formula for obtaining meteorological constants to these curious inequalities, as strongly recommended by Herschel, and so perseveringly carried out at the Oxford Observatory, will materially assist towards this end.

With a view to conciseness, I omit the details recorded in General Myer's Report, and only give in the following tables the mean values for the month of each of the meteorological elements, with the corresponding inequality for each hour. A similar table is added, giving the same data for Portland, Maine, the nearest meteorological station in the United States to Mount Washington, and distant from it about 90 miles, in a SE. direction. The observations at Mount Washington were made at each hour for the twelve hours from 6 a.m. to 6 p.m., and also at 9 p.m. and at midnight, for the whole of the 31 days. At Portland, the observations were made only at the usual term hours, namely at 7 and 8 a.m., and at 2, 5, 9 and 12 p.m. In the following tables, values for the remaining hours have been interpolated, by drawing a fair curve through the projected means of the observed values, when laid off on a moderately large scale. The values in the tables are for 30 days only, the observations for the 1st of May having been omitted. This was done for the purpose of getting separate means for three equal periods of ten days each. These means have been separately examined, and would undoubtedly give consistent results; but to introduce them here would make

this paper too long, and would not aid my present object. It may, howev be stated, in passing, that it is a mistake to suppose that satisfactory val for the inequalities cannot be calculated from the observations for a few d only. Ten to fifteen days are ample for most purposes, and a month m sometimes be too long a period; for example, at those parts of the ye when the sun's declination is changing rapidly. There is reason to beli that some of the co-efficients change their signs during the year, othe change the position of their nodes, so that it is possible by taking too long period, or by grouping incongruous periods together, to make importa elements appear small, or in extreme cases to cancel them out altogether. Mr. Drach, in a Paper which he presented to this Society many years ago, has calculated the inequalities in the meteorological elements for a number of single days, these being obtained from the observations taken on certain term days at the Greenwich Observatory. I have had the opportunity to examine this interesting paper, which affords valuable data for any one who is investigating the causes of the daily inequalities.

Table I. gives the means and inequalities for barometric pressure, and for that part of it which is due to vapour, at the summit and at the base stations at Mount Washington, the one at an elevation of 6285 feet and the other of 2639 feet above the sea-level. Table II. gives the means and inequalities of the temperature and the relative humidity for the same stations. Table III. gives similar data for Portland, the barometer at this station being 54 feet above the sea-level.

The same particulars which are given in these three tables, are also represented graphically by the dark curved lines on Plate III. The light curved lines represent the polar or semicircular part of the daily inequalities, and readily indicate to the eye the way in which this, usually the principal term, is modified by the smaller terms.

The next Table, No. IV., gives the values of each co-efficient obtained from the numbers in the preceding tables in the more expanded form, and Table No. V. the same co-efficients in the shorter form, with the angles U. &c. in the following general expression converted into time counting from midnight, as being more readily appreciated than the hour angles when measured by degrees of arc. Bessel's notation is used, as given in the translation of his Paper which is printed in Appendix IV. of the "Quarterly Weather Report," Part IV. 1870, where the recurring phenomenon y is represented by

$u + u_1 \sin\left(U_1 + \frac{2\pi x}{k}\right) + u_2 \sin\left(U_2 + \frac{4\pi x}{k}\right)$ + &c. &c., in which u, u_1, u_2 and U_1, U_2, &c. &c. are constants, and $\frac{2\pi x}{k}$, $\frac{4\pi x}{k}$ &c. &c., would represent, in the present case, 15°, 30°, 45°, &c., or 1 hour, 2 hours, 3 hours, &c.

The more expanded form, in which y, the temperature or pressure, reckoned from a given time, is put as

$= p + p_1 \cos\theta + q_1 \sin\theta + p_2 \cos 2\theta + q_2 \sin 2\theta + p_3 \cos 3\theta + q_3 \sin 3\theta +$ &c.

is preferable to the shorter one when it is intended to re-calculate the values for each period of y, so as to see how they will compare with the means of the

TABLE I.—[illegible] 2nd May to 31st May, inclusive. 1872.

Hours from mid-night.	Summit of Mount Washington, 6285 feet above sea level. Mean Pressure for the 30 days 23·7438 inches. Inequality from the observed values.	Inequality from the calculated co-efficients.	Difference.	Mean Pressure of Aqueous Vapour for the 30 days ·1554 inch. As calculated from Relative Humidity.	As re-calculated from the most probable values.	Difference.	Base of Mount Washington, 2639 feet above sea level. Mean Pressure for the 30 days 27·1631 inches. Inequality from the observed values.	Inequality from the co-efficients calculated from the observed values.	Difference.	Mean Weight of Pressure Vapour for the 30 days ·3137 inch. As calculated from Relative Humidity.	As re-calculated from the most probable values.	Difference.	Hours from mid-night.
	In. 23·7438±	In. 23·7438±		In. ·1554±	In. ·1554±		In 27·1631±	In. 27·1631±		In. ·3137±	In. ·3137±		
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
1	—·0013	—·0022	+·0009	—·0076	—·0077	+·0001	·0069	·0078	—·0009	—·0075	—·0094	+·0019	1
2	— 23	— 17	— 6	— 92	— 87	— 5	55	47	8	— 25	— 15	— 10	2
3	— 35	— 22	— 13	— 109	— 96	— 13	41	32	9	— 27	+ 15	— 42	3
4	— 54	— 51	— 3	— 75	— 79	4	33	35	— 2	— 27	— 8	— 19	4
5	— 79	— 99	20	— 58	— 60	2	31	40	— 9	— 34	— 40	6	5
6	— 122	— 131	9	— 58	— 69	11	38	43	— 5	— 24	— 77	53	6
7	— 170	— 151	19	— 85	— 82	— 3	51	46	5	— 108	— 99	— 9	7
8	— 158	— 151	— 7	— 70	— 57	— 13	68	42	26	— 92	— 21	— 71	8
9	— 116	— 115	— 1	— 2	— 8	6	21	44	— 23	176	156	20	9
10	— 13	— 31	18	50	31	19	38	27	11	351	294	57	10
11	47	46	1	61	64	— 3	11	16	— 5	301	301	0	11
12	57	81	— 24	86	101	— 15	— 1	— 11	10	223	229	— 6	12
13	75	71	4	127	123	4	— 79	— 70	— 9	141	58	— 17	13
14	51	57	— 6	107	117	— 10	— 124	— 145	21	79	61	18	14
15	64	46	18	130	114	16	— 232	— 196	— 36	— 81	— 89	8	15
16	40	43	3	143	139	4	— 160	— 187	27	— 134	— 208	74	16
17	40	59	— 19	130	150	— 20	— 145	— 144	— 1	— 279	— 226	53	17
18	100	99	1	98	107	— 9	— 86	— 81	— 5	— 212	— 181	31	18
19	121	115	6	52	36	16	2	— 6	8	— 95	— 117	22	19
20	108	95	13	— 21	— 21	0	45	58	— 13	25	— 25	50	20
21	44	51	— 7	— 50	— 58	8	68	79	— 11	54	70	— 16	21
22	27	27	0	— 100	— 91	— 9	87	85	— 2	30	74	— 44	22
23	6	10	— 4	— 116	— 106	— 10	90	87	3	— 58	— 35	— 23	23
24	— 5	— 9	4	— 70	— 91	21	78	92	— 14	— 101	— 113	12	24

NOTE.—The observations were made at 6 a.m. and each following hour until 6 p.m.; at 9 p.m. and at midnight. The values given for 1, 2, 3, 4, 5, 19, 20, 22 and 23 hours were obtained by drawing a free curve through the other values when plotted off on a moderately large scale.

TABLE II.—THERMOMETER.

2nd May to 31st May, inclusive. 1872.

Summit of Mount Washington 6285 feet above sea level.					Base of Mount Washington 2639 feet above sea level.				
Mean Temperature of the 30 days 33°·04 Fahrenheit.					Mean Temperature of the 30 days 46°·03 Fahrenheit.				
Hours from midnight.	Inequality from the observed values 33°·04±	Inequality from the calculated co-efficients for most probable values 33°·04±	Difference.	Relative Humidity 823±	Inequality from the observed values 46°·03±	Inequality from the calculated co-efficients for most probable values 46°·03±	Difference.	Relative Humidity 792±	Hours from midnight.
	°	°	°		°	°	°		
1	—1·73	—1·71	—·02	13	—3·30	—3·28	—·02	86	1
2	—2·27	—2·28	—·01	25	—3·90	—4·04	·14	117	2
3	—2·47	—2·57	·10	32	—5·03	—5·00	—·03	132	3
4	—2·33	—2·40	·07	33	—5·66	—5·66	·00	131	4
5	—2·10	—2·04	—·06	32	—5·73	—5·78	·05	122	5
6	—1·70	—1·71	·01	27	—5·20	—4·96	—·24	92	6
7	—1·47	—1·44	—·03	11	—3·20	—3·29	·09	22	7
8	— ·97	—1·03	·06	— 4	—1·06	—1·46	·40	— 41	8
9	— ·17	— ·42	·25	5	·00	·07	—·07	— 32	9
10	·37	·30	·07	13	1·10	1·54	—·44	— 35	10
11	1·10	1·07	·03	— 6	3·30	3·22	·08	— 63	11
12	1·57	1·70	—·13	5	4·97	4·64	·33	— 91	12
13	2·13	2·05	·08	— 3	5·10	5·40	—·30	—114	13
14	2·13	2·16	— 03	—10	5·67	5·74	—·07	—120	14
15	2·47	2·27	·20	—15	6·60	6·24	·36	—132	15
16	2·40	2·44	—·04	— 7	6·20	6·42	—·22	- 136	16
17	2·47	2·42	·05	—12	6·47	6·26	·21	—136	17
18	2·07	1·99	·08	— 9	5·14	4·94	·20	— 86	18
19	1·33	1·26	·07	—13	2·64	2·81	— 17	— 24	19
20	·50	·51	—·01	—22	- 0·16	·18	—·34	40	20
21	— ·03	— ·08	·05	—26	—2·53	—2·60	·07	70	21
22	— ·53	— ·50	—·03	—24	—3·70	—4·10	·40	76	22
23	— ·87	— ·81	—·06	—28	—4·03	—4·02	-·01	77	23
24	—1·00	- 1·18	·18	— 6	—3·53	—3·34	—·19	68	24

NOTE.—The observations were made at 6 a.m. and each following hour until 6 p.m.; at 9 p.m., and midnight. The values given for 1, 2, 3, 4, 5, 19, 20, 22 and 23 hours were obtained by drawing a fair curve through the other values when plotted off on a moderately large scale.

original observations, as has been done in the preceding tables; for it will be evident that at 1 a.m., the period at which we commence y_0 will be $= p + p_1 + p_2 + p_3 + p_4$ &c., and that 90° further on, say y_6, the observation will be $= p + q_1 + q_2 + q_3 + q_4$, &c., also that the observation for temperature or pressure half-way between these, say y_3, will be the sum of all these coefficients $\times$ sin 45°, and so on for the observations at the other four hours, y_1, y_2, y_4, y_5, using in each case as multipliers the sine and cosine of the

TABLE III.—PORTLAND, MAINE

2nd May to 31st May, inclusive. 1872.

	BAROMETER. 54 feet above the sea level.						THERMOMETER. Fahrenheit.				
	Mean Pressure for the 30 days 29·9634 inches.			Mean Pressure of Aqueous Vapour for the 30 days ·287 inch.			Mean Temperature of the 30 days 52°·72				
Hours from mid-night.	Inequality from the observed values. Inches. 29·9634±	Inequality from the calculated co-efficients for most probable values. Inches. 29·9634±	Difference.	As calculated from Relative Humidity. Inches. ·287±	As re-calculated from most probable values. Inches. ·287±	Difference.	Inequality from the observed values. 52°·72±	Inequality from the calculated co-efficients for most probable values. 52°·72±	Difference.	Relative Humidity, saturation being repre-sented by 1,000. 723±	Hours from mid-night.
	In.	In.	In.	In.	In.	In.	°	°	°		
1	·0036	·0033	+·0003	—·0050	—·0064	·0014	—3·72	—3·75	+·03	81	1
2	37	39	— 2	— 110	— 114	4	—4·22	—4·19	—·03	83	2
3	84	83	1	— 140	— 152	12	—4·52	—4·47	—·05	82	3
4	149	142	7	— 170	— 158	— 12	—4·52	—4·53	+·01	75	4
5	189	187	2	— 140	— 153	13	—4·12	—4·20	+·08	62	5
6	202	206	— 4	— 160	— 159	— 1	—3·32	—3·32	·00	42	6
7	189	194	— 5	— 140	— 142	2	—1·75	—1·69	—·06	9	7
8	140	142	— 2	— 80	— 81	1	·45	·43	·02	— 36	8
9	67	59	8	— 10	— 5	— 5	2·48	2·44	·04	— 68	9
10	— 30	— 32	2	50	50	0	3·88	3·82	·06	— 85	10
11	— 123	— 121	— 2	80	92	— 12	4·68	4·71	—·03	— 94	11
12	— 217	— 209	— 8	130	140	— 10	5·18	5·11	·07	— 99	12
13	— 279	— 283	4	130	140	— 10	5·28	5·31	—·03	—100	13
14	— 307	— 307	0	130	116	14	5·18	5·09	·09	— 98	14
15	— 299	— 301	2	70	98	— 28	4·58	4·57	·01	— 87	15
16	— 258	— 250	— 8	120	104	16	3·68	3·68	·00	— 67	16
17	— 176	— 173	— 3	90	107	— 17	2·28	2·38	—·10	— 39	17
18	— 64	— 72	8	70	81	— 11	·88	·86	·02	— 9	18
19	38	34	4	70	54	16	— ·32	— ·39	·07	21	19
20	110	116	— 6	50	47	3	—1·22	—1·23	·01	44	20
21	151	155	— 4	40	43	— 3	—1·95	—1·86	—·09	62	21
22	154	156	— 2	20	16	4	—2·52	—2·46	—·06	70	22
23	128	127	1	— 10	— 14	4	—2·92	—2·99	·07	75	23
24	85	79	6	— 40	— 34	— 6	—3·32	—3·39	·07	76	24

NOTE.—The observations were made at 7, 8, 14, 17, 21 and 24 hours. The values for the remaining hours were obtained by drawing a fair curve passing through the observed values when plotted off on a moderately large scale.

respective angles. When these values of p and q are thus obtained for the first quadrant, we have merely to repeat the same figures in the proper order and with their proper signs, for the remaining three quadrants. As in practice the product of these terms and of the terms p_1, q_1, p_2, q_2, p_3, q_3, &c. with the sines or cosines of their respective angles is at once ascertained, by

inspection, from a Table* prepared for the purpose, the work is not nearly so great as it may appear at first sight, and the process can be easily mastered by persons who have no knowledge of trigonometry or of algebra, beyond the power to add and subtract plus and minus quantities.

It would be very easy, after the first co-efficients for the Mount Washington and Portland observations had been obtained, to have interpolated new values for the hours on which no observations were taken, so as to have reduced to some extent the differences between calculation and observation given in Tables I. II. and III.; but the result in the present case would not have been worth the trouble, and I preferred to show the first attempts without any trimming. These differences, it will be observed, are generally very small, except in the columns for vapour pressure. Even here the differences cannot be deemed important, when we consider in what a comparatively rough mode relative humidity is ascertained.

Before offering any opinion on the cause or causes of the hourly inequalities, it will be convenient to define the terms employed in Tables IV. and V., as they will frequently be used in the remaining part of this Paper. I allude to the expressions, polar or semicircular, quadrantal, sextantal and octantal, &c., which are used in place of speaking of the terms depending on θ, on 2θ, on 3θ, &c., or of p, p_1, q_1, p_2, q_2, &c., or $\sqrt{p^2_1 + q^2_1}$, &c. These expressions seem to me appropriate, and were introduced some years ago by the late Archibald Smith, M.A., F.R.S., to designate certain analogous magnetic co-efficients. Thus, by "polar or semicircular" is meant the inequality which has only one + maximum and one — maximum, at 180°, or 12 hours, or 6 months apart from each other. For example, speaking of daily temperature, it is that part of it which has its + maximum generally between 1 and 2 p.m., and its — maximum between 1 and 2 a.m. When projected it forms a curve of sines; and, if this were the only inequality, the mean temperature of the day would be observed when the nodes occur, and the mean of any two temperatures taken 12 hours apart would be the correct mean temperature for the 24 hours. The next term in the equation is called "quadrantal," and is also correctly represented by curves of sines, and it is usually the principal factor in destroying the beautiful simplicity which appears to be sought for by some meteorologists. It is so called because it has a maximum value in each quadrant of the day or year: two + maxima, 180°, or 12 hours, or 6 months apart, and two — maxima at the same distance from each other, and at half that distance from each + maximum. If this were the only inequality, mean temperature might be observed at either of the 4 periods at which the nodes of the curve occur, or by taking a mean of any two observations 90°, or 6 hours, or 8 months apart. When this term is combined with the semicircular, it is necessary to take four equidistant observations to obtain a correct mean. Similarly, the "sextantal" and

* I shall be happy to supply a copy of this Table to any of the Fellows of the Meteorological Society who may not have one, and who will send me an envelope with their address.

TABLES showing the values of the co-efficients for the different inequalities recorded in Tables I. II. and III.

TABLE IV.

	Mean Value, or	Polar or semi-circular co-efficients.		Quadrantal co-efficients.		Sextantal co-efficients.		Octantal co-efficients.		Duodecantal co-efficients.	
	p	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_6	q_6
BAROMETER.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Summit of Mount Washington	23·7438	—·0030	—·0094	+·0029	—·0001	—·0017	+·0039	+·0003	—·0008	—·0008	—·0001
Base of Mount Washington	27·1631	+·0085	+·0044	—·0012	—·0070	—·0011	+·0018	+·0012	—·0006	+·0004	—·0006
Portland, Maine	29·9634	+·0183	+·0076	—·0115	—·0061	—·0022	—·0004	—·0004	—·0003	—·0003	—·0003
Difference between Base and Summit Stations	From observations. *3·4193	+·0114	+·0137	—·0039	—·0069	+·0010	—·0018	+·0009	+·0003	+·0009	—·0008
	From the calculated values. *3·4193	+·0112	+·0036	—·0041	—·0070	+·0003	—·0022	+·0008	—·0002	+·0012	—·0005
VAPOUR PRESSURE.											
Summit of Mount Washington	·1554	—·0110	—·0046	+·0011	+·0031	+·0010	+·0013	·0000	—·0014	+·0012	—·0001
Base of Mount Washington	·3137	—·0067	+·0079	+·0060	—·0120	—·0050	+·0070	—·0038	+·0022	+·0004	+·0026
Difference between Vapour Pressure at Base and Summit	*·1583	+·0043	+·0126	+·0055	—·0153	—·0069	+·0057	—·0038	+·0032	—·0008	+·0026
Portland	·2866	—·0103	—·0089	+·0030	—·0031	+·0001	+·0009	—·0003	—·0007	+·0011	—·0001
THERMOMETER.	°	°	°	°	°	°	°	°	°	°	°
Summit of Mount Washington	33·04	—1·94	—1·39	+·09	+·05	+·06	—·04	+·04	—·21	+·04	—·01
Base of Mount Washington	46·03	—5·33	—2·70	+·63	+·73	+1·01	+·35	+·40	—·14	+·01	—·15
Difference of Temperature at Base and Summit	*12·99	—3·37	—1·32	+·56	+·70	+·90	+·30	+·39	+·03	—·08	—·14
Portland	52·72	—4·83	—·66	+·87	—·58	+·30	—·01	—·13	+·11	+·05	—·03

* These values were not obtained by merely taking the difference between the other co-efficients, but, as a test of the correctness of the calculations, were separately calculated from the hourly observed and calculated values.

TABLE V.

	Mean Value or p	Maximum Polar Value or $\sqrt{p^2_1+q^2_1}$	Hour at which +Max. value occurs.	Maximum Quadrantal Value, or $\sqrt{p^2_2+q^2_2}$	Hour at which 1st +Max. value occurs.	Maximum Sextantal Value, or $\sqrt{p^2_3+q^2_3}$	Hour at which 1st +Max. value occurs.	Maximum Octantal Value, or $\sqrt{p^2_4+q^2_4}$	Hour at which 1st +Max. value occurs.	Maximum Duodecantal Value, or $\sqrt{p^2_6+q^2_6}$	Hour at which 1st +Max. value occurs.
BAROMETER.	In.	In.	H. M.	In.	H. M.	In.	H. M.	In.	H. M.	In.	H. M.
Summit of Mount Washington	23·7438	·0099	17 49	·0029	0 56	·0043	3 31	·0009	5 51	·0008	3 · 5
Base of Mount Washington	27·1631	·0096	2 49	·0071	9 41	·0021	3 42	·0013	0 33	·0007	0 22
Portland, Maine	29·9634	·0198	2 30	·0130	7 56	·0022	5 14	·0005	4 37	·0004	3 30
Difference between Base and Summit Stations .... (From observations.)	*3·4193	·0178	4 21	·0079	9 1	·0021	7 39	·0010	1 18	·0012	0 32
(From calculated values.)	*3·4193	·0176	4 22	·0081	8 58	·0022	7 10	·0008	0 46	·0013	0 45
VAPOUR PRESSURE.											
Summit of Mount Washington	·1554	·0119	14 31	·0033	3 21	·0016	2 10	·0014	5 30	·0012	0 57
Base of Mount Washington	·3137	·0104	9 44	·0134	10 53	·0086	3 47	·0044	3 30	·0026	1 54
Difference between Vapour Pressure at Summit and Base........................	*·1583	·0133	5 45	·0163	10 40	·0090	4 7	·0050	3 20	·0027	2 11
Portland..........................	·2866	·0136	15 53	·0043	11 28	·0009	2 52	·0008	5 7	·0011	0 57
THERMOMETER.	°	°		°		°		°		°	
Summit of Mount Washington	33·04	2·39	15 22	·10	1 58	·07	0 15	·21	5 41	·04	0 51
Base of Mount Washington	46·03	5·98	14 47	·96	2 38	1·07	1 25	·42	0 41	·15	0 3
Difference of Temperature between Summit and Base......................	*12·99	3·62	14 26	·90	2 43	·95	1 25	·39	1 4	·16	3 40
Portland..........................	52·72	4·88	13 31	1·05	11 53	·30	1 0	·17	2 20	·06	0 20

"octantal" terms are so called, because they have respectively a maximum value in each sextant and each octant, and their + and — maxima are one sixth and one eighth of the circle, the day, or the year, apart from each other. As two or three or more of these causes of inequality are generally present, it will be readily seen that it is only by taking the means of two-hourly or hourly observations that we can get approximately correct results, and that by hourly observations we get double the number of equations for determining the most probable value for each of the co-efficients.

Returning now to Plate III., I would first ask attention to the temperature curves. The most noticeable feature is perhaps the late hour at which the + maximum temperatures occur at the mountain stations, and the early hour at which they occur at Portland. At the summit station there is not half a degree difference in the temperature from about 12.30 to 6 p.m., a period of five and a half hours. The minimum temperature occurs about 8 a.m., and the inequalities are small. At the base of Mount Washington, the inequalities are comparatively large. The maximum temperature does not change more than half a degree from 2.30 to 6 p.m., a period of three and a half hours, while during the next three and a half hours it falls through 8°·5. There are two distinct minima, the one about 10.30 p.m., the other about 5 a.m. After 10.30 p.m., the temperature steadily rises for more than two hours. How is this to be accounted for? I venture to suggest that the great down-rush of cold air from the summit of the mountain, commencing about 6 p.m., and augmenting as the evening advances, drives back, for a time, the warmer air of the lower ground. When this rush of cold air has somewhat spent itself, and the lower and warmer air gradually mixes with that from the mountain, the temperature of the station is correspondingly raised until 1 a.m., when the general cooling process again goes steadily on until near 5 a.m., *i.e.* for two hours after the temperature at the top of the mountain has begun to rise. We must also notice the fact that the extreme night temperature is further under the mean than the maximum day temperature is above the mean. At Portland, on the contrary, Plate III. shows that the quadrantal inequality has the effect, first, of increasing the maximum day temperature and decreasing the cold at night, and next, of causing the maximum temperature to occur earlier in the day. It will also be seen that while the polar or semicircular maximum, as shown by the light curve, occurs about 2 p.m., the quadrantal and the other small inequalities together produce a temperature equal to the polar maximum soon after 11 a.m., and combine to maintain that temperature for a space of about three hours. The curve of temperature at this station reminds me of bright sunny mornings and cloudy afternoons, and of those places between the tropics where, in what would otherwise be the hottest part of the day, the heat is tempered by the intervention of a curtain of cloud. It would be interesting to ascertain whether this was a marked feature of the weather at Portland in May, 1872.

It is easy to offer an explanation for the late occurrence of the maximum temperature at an isolated mountain station, especially if it is situated on the western slope; but it must be remembered that the maximum temperature at Saint Bernard is said to occur before noon.

It must also be noticed that while in the month of May the sun is above the horizon considerably more than twelve hours, the temperature at all those stations is above the mean for less than twelve hours.

A comparison of the barometric curves on Plate III. will bring out quite as many points of interest as those for temperature; but I desire chiefly to direct attention to the distinctness and importance of the quadrantal inequality. This inequality, though frequently concealed in latitudes like our own, by great lateral displacements of the atmosphere, may, I believe, be shown to exist always at any place at which the sun sets each 24 hours, and it may be traced even in those regions where the difference between day and night at some seasons of the year consists only of a small change in the sun's altitude.

There is reason for believing that the barometric inequalities correspond closely with those of temperature, though there are disturbing causes which will have to be alluded to. The barometric inequalities occur later, and have opposite signs. Thus when the barometer is rising, the thermometer is falling, and *vice versâ*, this being quite a distinct phenomenon to that which has been so frequently noticed of a higher barometer in cold than in warm weather. In places where the weather is continuously fine and regular, this reciprocity is very apparent; for example, on discussing some Bermuda observations, I found these changes occurred with great persistency, the barometric inequalities, with the opposite sign, occurring about two hours later than the similar inequalities of the thermometer, showing, apparently, that it takes about this time for the diffusion of the surface heat through the lower strata of the atmosphere. I have no doubt that examples of similar reciprocity could easily be found in the station records of this country.

It must not be supposed that these barometric inequalities are necessarily accompanied by a lateral transfer of air. I know that some meteorologists have suggested an overflow of the top of the expanded atmosphere into the surrounding districts, accompanied by an inward movement of colder air below. This suggestion is really attended by many and superfluous difficulties. Let us suppose the air over a given area, say a square yard, or a square mile, or a hundred square miles, to be separated from the neighbouring atmosphere by thin, elastic, diathermous walls, the whole of the hourly inequalities may be conceived as occurring within them, without causing any sensible difference in the parallelism of these walls or in the relative pressure on their two sides. Further, let us suppose that the enclosed area, as well as the surrounding area for a considerable distance, to be subject to an increase of surface temperature. The particles of air on that surface, and more particularly the particles of vapour expanding, would ascend until they parted with their extra heat to the adjacent particles. This action would go on so long as the increments of temperature were supplied, but would not extend to any great height, for in the Mount Washington observations it will be seen that a change of 5°·5 at the base is reduced to a change of 3°·5 at the summit, and it would be less than this at the same height had there been no mountain there. It may be inferred from this that, at only a moderate height above the mountain, and a very long way

below the upper limits of the atmosphere, the effects of this change of temperature would not be appreciable, and the result of the vertical movement in the lower stratum of the atmosphere would be merely a raising of the centre of gravity of that stratum; and that this raising of the centre of gravity would not affect the surface barometer, unless the upward movement itself caused mechanically a decrease of pressure, but it would increase the pressure on an elevated barometer, such as that at the top of the mountain, by the amount of the air which had been raised from below to above it. The greater expansion of vapour of water as compared with the expansion of the other gases in the atmosphere would much assist in this raising of the centre of gravity of the lower stratum of the atmosphere, as well as in increasing the relative velocity of the upward movement. But this upward movement itself will, it is now contended, affect the pressure upon both of the barometers and especially that upon the lower barometer, for, by, hypothesis, the air for a considerable distance outside the enclosed space is subject to the same changes of temperature, &c. as that within it, and the inward and outward pressure upon the walls of our supposed enclosure would exactly balance each other. On the ordinary hypothesis the inertia and elasticity of the air over the larger area would for a time prevent any of the supposed inward pressure from the exterior and heavier air being felt within our enclosed central area.

Thus far, then, we have considered an elevation of the centre of gravity of the lower stratum of air duly recorded by an increase of pressure on the elevated barometer, and a decreased pressure on the lower barometer caused by the upward movement of the heated air and vapour, and both corresponding in degree, though later as regards time, with the sum of the increments to the surface temperature. In proportion as the increments of temperature, when projected, produce a polar curve of temperature, the upper barometer, by its projected polar curve, will show an increase of pressure, while the lower barometer will show in the same way a regular decrease of pressure, as delineated on Plate III. It is easy to conceive that at some point between the summit and base of Mount Washington there must be a station where these contrary movements of the two barometers would disappear, and where a barometer would show no polar change.

Before passing to the quadrantal and smaller inequalities a word must be said on another feature of this investigation which materially affects the polar as well the other inequalities, namely, the actual addition which is made to the weight of the air within the supposed enclosure by the surface water which is evaporated. To the extent that the increments of heat are polar in character, there will be an increase of pressure from the polar inequality arising from this vapour on both of the barometers. The weight of the water thus added to the air will tend to increase the polar rise referred to above in the summit barometer, and to decrease the polar fall in the lower barometer. In some cases this additional weight of vapour might be conceived as exactly balancing the decrease of pressure on the lower barometer which is due to the upward movement of the air, but I have not yet met with a case of this kind.

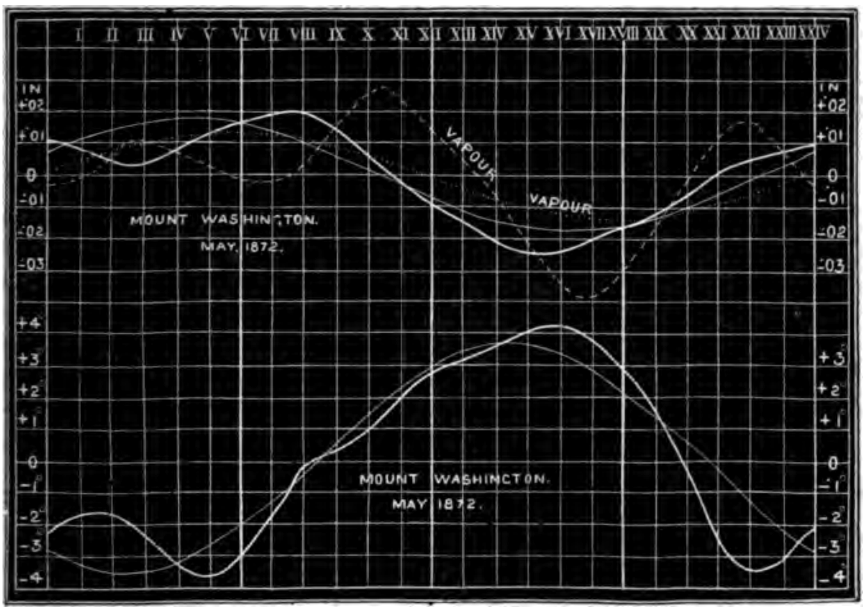
As the quadrantal component of the barometric inequality is so large, and its origin has been attributed to a similar inequality of temperature, it will be necessary to offer some explanation of the quadrantal inequality in the temperature, and why it is always so apparent in the barometer and at times so very imperfect or small in the temperature observations. In reference to the latter, I may name that I have selected from the Kew records, as printed in the "Quarterly Weather Reports," short periods when the temperature inequalities were comparatively slight, and yet the barometer inequalities were very decided. In such cases it must be remembered, that although the earth's surface may be sheltered by thick clouds and the temperature be kept very nearly equable, the sun is still shining on the upper surfaces of these clouds, and that these surfaces, as respects the atmosphere above them, take the place and perform the same functions as the surface of the ground at other times. We have thus similar movements, if not quite to the same extent; and these movements will be recorded by the barometer. From this it will be seen that the surface thermometer, however necessary and useful it may be, is not so complete a guide to the general state of the atmosphere above us as is the barometer.

As the barometer inequalities are attributed to temperature inequalities, it thus becomes the more essential to show not only that these inequalities are apparent in surface temperature under favourable circumstances, but also to show that a physical cause can be assigned for them. This cause may be indicated without the aid of mathematical formulæ; but the complete investigation, even if within my power, will be unnecessary here. It will, I think, be readily seen that the heat on a horizontal surface presented to the sun's rays at the equinoxes, for a few minutes at each hour, from sunrise to sunset, would, if projected as ordinates from an axis, whose abscissæ were the hourly intervals, present us with a regular polar curve of sines. But in addition to this regular increase of heat, due to the sun's altitude, there will be the cumulative effect from the heat already received and retained; and unless it can be shown that these additions increase in the same ratio as the sun's altitude, it follows that some new term, not a polar one, has been introduced. It may be conceived that during a period of 6 hours, say from 7 A.M. to 1 P.M., or from 8 A.M. to 2 P.M., a part of the accumulated heat has regularly increased during the first half of this time, and as regularly decreased during the other half, and this is all that is required to account for a quadrantal term in the curve of daily temperature. Such considerations as these will, I think, easily suggest physical causes for the quadrantal, sextantal and similar terms in the equations for both temperature and pressure.

The absorption and concealment of a large portion of the heat derived from the sun by the conversion of watery particles into vapour, also plays an important part in producing the inequalities, and more especially in regulating them so that the same co-efficients which represent *daily* temperature and pressure, also represent with equal accuracy the *nightly* temperature and pressure; and this is so whether the days are 16 hours long, as in a portion of our summer, or only 8 hours long, as during a part of our winter. There is

no absolute need for this correspondence between the night and day inequalities for any given period of 24 hours, and in testing the means of some such periods I have found small, but real, differences in the quadrantal co-efficient of the night hours as compared with that for the day hours, and in that for the A.M. hours as compared with that for the P.M. hours. Very little trace of this is, however, usually to be found, and it will be a source of constant surprise and wonder to those who will go into the subject, to see how beautifully the mathematical expression represents the actual observations, and what an important part the watery particles and vapour in the atmosphere play in producing this result. We are told by astronomers that this periodicity must occur even in the remotest effects of phenomena which originate with the sun. One may, however, be allowed the expression of some "special wonder," when he finds that the hourly inequalities in the motion of the "fickle and uncertain wind" yield on analysis as consistent results as do the discussion of the daily inequalities of the barometer and thermometer. It was evidence of the effect of ascending and descending currents obtained while investigating the hourly inequalities of the wind at Liverpool, which led me to also look for evidence of it in the hourly inequalities of the barometer.

In proceeding to the curves of vapour pressure at the three stations now under consideration, as delineated on Plate III., it will be seen that their range is greater and the inequalities more marked than in the curves of total pressure.* This is more clearly shown in the accompanying woodcut, which exhibits the difference between the summit and base observations at Mount



* I purposely avoid the use of the term "vapour tension." This seems to me a misleading expression, so far as meteorology is concerned.

Washington for total pressure, vapour pressure, and temperature. The exact values of these differences have already been shown in Tables IV. and V., but the immediate comparison through the eye of the curves of polar inequality with those of total inequality is more striking than the inspection of mere lines of figures. It will be observed, that although the difference in the weight of vapour at the two stations is not $\frac{1}{20}$ of the weight of the intervening air, yet the polar inequality for vapour is about $\frac{3}{8}$ of the whole; and that the vapour inequalities, taken together, considerably exceed in amount, speaking only of the atmosphere lying between the levels of the two stations, those which belong to the weight of the air at the base station taken as a whole. This also very plainly indicates, if further proof were required, how very important a function is performed by the vapour in the atmosphere, as well as the limited height of the stratum of air in which this function is exhibited.

Referring again to the supposed enclosed column of air, it appears to me that the following daily changes take place in it, and that they account, if not completely, certainly to a great extent, for the daily inequalities in barometric pressure, without having recourse to any lateral transfer of air. It is not denied that a small lateral transfer may also occur; but this may probably be sufficiently represented by a bulging in of the one side and a bulging out of the opposite side of the supposed elastic walls enclosing the otherwise vertical column of air, these bulgings in and out corresponding to what Herschel has called a tendency of the air towards the points of sunrise and sunset. In the early part of the day the heat of the sun evaporates the dew and surface moisture, and in this way a great deal of heat becomes latent; but the vapour then formed gradually adds to the weight of the air, as is shown either by the actual rise of the barometer, as at the Portland station, or by the check, continued through several hours, of the downward movement of the barometer, as shown by the barometer curve for the base station at Mount Washington. As noon approaches, and all through the afternoon, the accumulated heat causes such a decided upward movement of the air that all the barometers then show a well-marked depression, the greatest depression always occurring some time after the hottest part of the day. As the evening comes on, the source of the heat having gone below the horizon, a rapid cooling and consequent descent of air takes place, and this is shown by a decided rise in the barometer, which goes on until 10 or 11 p.m., when the downward movement is somewhat expended, and when the barometer begins again to fall. This, with the continued condensation and deposit of the moisture in the air, brings the morning minimum. With the rising of the sun again recur the inequalities of another day.

The barometer curves for the base of Mount Washington, and for Portland, are very good types of those given generally by surface stations. By calculating the polar co-efficient, and adding the polar curve to any diagram of mean daily barometric range, the quadrantal inequality, the chief feature in barometric observations, will immediately become apparent.

Whatever difference of opinion there may be as to the explanation of the hourly inequalities which I have now attempted, there will, I think, be little

doubt that the discussion of the Mount Washington records shows that meteorological observations made at mountain stations, while affording much valuable information respecting the daily changes in our atmosphere, possess some causes of irregularity which would disappear in similar observations made in a captive balloon. Would it not be possible to construct captive balloons of a very moderate size, but capable of supporting meteorological instruments, which could record automatically, by means of small wires conveying the necessary galvanic current, the required data at an observatory situated below them? The risks to which Mr. Glaisher and others have submitted in order to make such observations, for very brief periods only, clearly prove how much such information is desired. Apparently, it would not be very difficult or very expensive to keep three such balloons at elevations of 1000, 2000, and 3000 feet, respectively, say in the neighbourhood of Kew. The utility of such elevated stations for determining the nature and causes of the hourly meteorological inequalities which we have now been discussing, will, I trust, need no further argument. The subject has a more extended range than is at first apparent. About three years since, when I showed Mr. Glaisher some of the results which I had obtained from examining the hourly inequalities of the wind at Liverpool, he at once noted the correspondence of the hours of change with those which had been obtained in the discussion of the Greenwich magnetic inequalities, and thus indicated an apparent connection between what may be considered very diverse meteorological phenomena.

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

MAY 20th, 1874.

Ordinary Meeting.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

DAVID GRANT BRIGGS, Calcethorpe Manor, Louth, was balloted for, and duly elected a Fellow of the Society.

The names of two Candidates for admission into the Society and of twelve gentlemen proposed as Honorary Members were read.

Mr. G. M. WHIPPLE and REV. C. GAPE were admitted Fellows of the Society.

A Memorandum, entitled "Suggestions for the Observation of Periodical Natural Phenomena," prepared by the PRESIDENT, at the request of the Form Committee, was read as an authorised Report from the Council. (p. 169.)

The following papers were then read:—

"Some Remarks on the Estimation of Wind Force, and on the Relation between Pressure and Velocity." By C. O. F. CATOR, M.A., F.M.S. (p. 171.)

"On the Weather of Thirteen Winters." By R. STRACHAN, F.M.S. (p. 178.)

"On a New Deep Sea and Recording Thermometer." By H. NEGRETTI, F.M.S., and J. W. ZAMBRA, F.M.S. (p. 188.)

"On a New Mercurial Minimum and Maximum Thermometer." By S. G. DENTON, F.M.S. (p. 193.)

The Meeting was then adjourned.

JUNE 17TH, 1874.

Ordinary and Special General Meetings.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

REGINALD BUSHELL, F.R.A.S., Hinderton, Neston, Cheshire;
TYSON CRAWFORD, 50 Canonbury Park North, N.;
GEORGE GARDINER, 244 High Holborn, W.C.;
RUPERT SMITH, The Priory, Dudley;
J. H. STEWARD, 406 Strand, W.C.; and
FRANCIS ERNEST TWEMLOW, 12 George Street, Portman Square, W.,
were balloted for and duly elected Fellows of the Society.

PROF. C. H. D. BUYS BALLOT, Director of the Royal Dutch Meteorological Institute, Utrecht;
HERR WILHELM VON FREEDEN, Director of the Nord Deutsche Seewarte, Seemanns Haus, Hamburg:
DR. CARL JELINEK, Director of the Hohe Warte, Vienna;
GEORGE T. KINGSTON, M.A., Superintendent of the Meteorological Office of the Dominion of Canada, Toronto;
DR. JOHANN VON LAMONT, Director of the Royal Observatory, Munich;
PROF. ELIAS LOOMIS, L.L.D., Yale College, New Haven, Connecticut, U.S.;
DR. H. MOHN, Director of the Meteorological Institute of Norway, Christiania;
DR. GEORGE NEUMAYER, Hydrographer to the Imperial German Navy, Berlin;
DR. E. PLANTAMOUR, Professor at the Academy, Geneva;
MONS. CHARLES SAINTE-CLAIRE DEVILLE, Inspector of Meteorological Stations in France, 8 Rue des Vieux Colombiers, Paris;
PADRE ANGELO SECCHI, S.J., Director of the Observatory del Collegio Romano, Rome; and
DR. HEINRICH WILD, Director of the Physical Central Observatory, St. Petersburg,
were balloted for, and duly elected Honorary Members of the Society.

The name of one candidate for admission into the Society was read.

Mr. B. FRANCIS COBB was admitted a Fellow of the Society.

The following papers were then read:—

"On the connection between Colliery Explosions and Weather in 1872." By ROBERT H. SCOTT, F.R.S., and WILLIAM GALLOWAY. (p. 195.)

"Solar Radiation, 1869-1874." By Rev. FENWICK W. STOW, M.A., F.M.S. (p. 205.)

"The Diurnal Inequalities of the Barometer and Thermometer, as illustrated by the observations made at the summit and base of Mount Washington, U.S., during the month of May, 1872." By W. W. RUNDELL, F.M.S. (p. 217.)

"On the Diurnal Variation of the Barometer at Zi-Ka-Wei, (a suburb of Shanghai, 31° 15′ North Latitude,) and mean Atmospheric Pressure and Temperature at Shanghai." By Rev. AUG. M. COLOMBEL, S.J. (Communicated by Rev. S. J. PERRY, F.R.S.)

[Received May 6th, 1874.]

I.—*Diurnal Variation of the Barometer at Zi-Ka-Wei.*—The diurnal variation of the barometer being very sensible at Zi-Ka-Wei, it was important, in studying it, to know the hours at which the barometer attained its mean height.

The instrument used was a Fortin's barometer, which has been compared several times, and has been kept in a good condition during the continuation of the observations. The observations have been carried on from October, 1872, to the end of February, 1874. They were taken at 23 feet above the level of the sea.

The method adopted in making the table of mean heights of the barometer at each hour of the day has been the following:—The movement of the barometer from one hour to the next has been measured as often as possible, the mean of the movements observed between the same hours during a corresponding season has given the horary movement of the barometer for each season: from these has been deduced the diurnal mean curve of the barometer, and finally the horary excesses above the mean which alone are given in the Table.

These mean hourly excesses give the hourly means, the tropical hours, and the extent of the diurnal variation. They admit of the barometric diurnal mean being obtained with great exactitude when the observations have been made at any hours whatever.

TABLE I.—Diurnal Variation of the Barometer at Zi-Ka-Wei.

Excess above the Mean.

Hour.	Winter.	Spring.	Summer.	Autumn.
	In.	In.	In.	In.
Midnight	+·0083	+·0071	+·0020	+·0071
1	+·0035	·0000	—·0071	+·0020
2	—·0012	—·0091	—·0126	—·0043
3	—·0055	—·0134	—·0165	—·0122
4	—·0102	—·0134	—·0169	—·0134
5	—·0087	—·0118	—·0102	—·0083
6	—·0020	—·0004	·0000	+·0012
7	+·0110	+·0142	+·0110	+·0150
8	+·0228	+·0256	+·0181	+·0268
9	+·0350	+·0354	+·0224	+·0347
10	+·0394	+·0378	+·0228	+·0339
11	+·0260	+·0307	+·0193	+·0205
Noon.	+·0028	+·0177	+·0087	+·0008
1	—·0197	—·0020	—·0035	—·0189
2	—·0354	—·0177	—·0130	—·0323
3	—·0370	—·0291	—·0205	—·0339
4	—·0319	—·0358	—·0248	—·0299
5	—·0236	—·0339	—·0252	—·0240
6	—·0138	—·0283	—·0181	—·0161
7	—·0039	—·0169	—·0067	—·0043
8	+·0043	—·0024	+·0059	+·0067
9	+·0098	+·0094	+·0177	+·0134
10	+·0146	+·0157	+·0220	+·0138
11	+·0110	+·0150	+·0157	+·0134

			Winter.	Spring.	Summer.	Autumn.
			h. m.	h. m.	h. m.	h. m.
Mean Hours	A.M.		1 45	1 0	0 12	1 18
			6 9	6 1	6 0	5 51
	P.M.		0 7	0 53	0 43	0 3
			7 28	8 11	7 31	7 24
			Between	Between	Between	Between
			h. h.	h. h.	h. h.	h. h.
Tropical Hours ..	A.M.	Min.....	4 and 5	3 and 4	3 and 4	3 and 4
		Max.....	9 „ 10	9 „ 10	9 „ 10	9 „ 10
	P.M.	Min.....	2 „ 3	4 „ 5	4 „ 5	2 „ 3
		Max.....	10 „ 11	10 „ 11	About 10	About 10
			In.	In.	In.	In.
Half oscillation for the day			·0764	·0740	·0480	·0685
„ „ night			·0248	·0291	·0390	·0272
Mean range			·0504	·0516	·0437	·0480

II.—*Atmospheric Pressure at Shanghai.*—There are at hand a certain number of barometric observations made at Zi-Ka-Wei or at Ton-Kia-Tou, which are two suburbs of Shanghai. Those have been selected which have been made with recognised and compared instruments (Fortin de Fastré et d'Alvergnat). As they were neither made at the same elevation, nor at the same hours, they have

been reduced to the level of the sea, and a correction has been applied to the relative to the hours of observation, which was given by the preceding tabl The results thus obtained are combined in the following Table; they give tl height of the mean barometric pressure at the sea-level at Shanghai, which perhaps nearer the truth than any previous one.

TABLE II.—Atmospheric Pressure at Shanghai.

Month.	1865.	1866.	1867.	1868.	1872.	1873.	1874.	Means.
	In.	In.	In.	In.	In.	In.	In.	In.
January	..	30·354	30·303	30·244	..	30·333	30·410	30·329
February	..	·193	·318	..	..	·276	·308	·274
March	..	·130	·101	..	..	30·254	..	·162
April	..	30·109	30·011	..	30·019	29·982	..	30·030
May	..	29·832	29·837	..	29·930	·870	..	29·867
June	..	·792	·731	..	·853	·769	..	·786
July	..	..	..	..	·687	·729	..	·708
August	..	..	..	..	·696	·805	..	·751
September	..	29·893	29·922	..	29·990	29·875	..	29·920
October	..	30·128	30·096	..	30·136	30·152	..	30·128
November	..	·303	·297	..	·275	·291	..	·291
December	30·324	·350	·295	..	·232	·280	..	·296

Yearly Mean = 30·045 in.

III.—*Mean Temperature at Shanghai from the daily Maxima and Minima.* These observations have also been made at Zi-Ka-Wei or at Ton-Kia-Tou, w good instruments several times verified. The exposure being changed seve times, and not having always being in perfect shade, these means are not ab lutely to be relied upon; but, such as they are, they show sufficiently t annual march of temperature, and give means for the months and year, perha more exact than any which have hitherto been given.

TABLE III.—Mean Temperature from the daily Maxima and Minima at Shangl

Month.	1865.	1866.	1867.	1868.	1871.	1872.	1873.	1874.	Means.
	°	°	°	°	°	°	°	°	°
January	..	39·3	37·7	38·6	..	38·4	37·2	34·3	37·6
February	..	41·7	41·4	..	..	37·9	40·8	39·7	40·3
March	..	47·8	50·9	..	49·7	50·0	45·8	..	48·8
April	..	53·1	58·0	..	58·2	60·8	61·4	..	58·3
May	..	66·8	66·6	..	68·8	68·2	67·4	..	67·6
June	..	73·0	75·8	..	77·5	71·8	72·6	..	74·2
July	..	..	..	..	85·4	86·4	83·6	..	85·1
August ..	..	85·0	..	..	84·7	82·2	80·6	..	83·1
September	..	72·6	72·3	..	79·3	74·4	73·9	..	74·6
October ..	..	63·6	65·6	..	68·0	65·0	62·3	..	64·9
November	..	50·8	48·2	..	53·1	53·2	53·1	..	51·7
December	45·5	44·3	45·0	..	38·2	48·0	45·7	..	44·5

Yearly Mean = 60°·9.

"Weather Report for 1873, at Woosung, China." By CHARLES D. BRAYSH (Communicated by R. H. SCOTT, F.R.S.)

[Received April 30th, 1874.]

The gales of January 1873 were of unusual severity; and the depression the mercury taken during that month over the coast of China from Foochow far north as Chufoo, was very great. The barometrical reading of 29·700 inc in Shanghai on the 3rd of January was registered with a temperature of 25° The maximum 30·651 inches in February was lower than the highest rise of 1l and 1872, though higher than any reading of 1867, 1868, 1869 and 1870.

The maximum temperature, 96°, in the month of July, was 2° below what

rose to in 1867, 1868, 1869, 1870 and 1872, and 3° in 1871. The minimum of 23° in the month of February was identical with what it fell to in January 1872. The lowest range of thermometer for the first seven years was 26° in January 1867; 19° in December 1868; 21° in January 1869; 22° in January and December 1870; 19° in December 1871; 23° in January 1872; and 23° in 1873.

A careful register of the ozonometer has been kept both night and day. Observations of these delicate air tests are vitiated when gases are developed; but if the gradations 6 and 7 of Schönbein's scale really indicate a healthy atmosphere, most certainly Shanghai is a favoured spot.

With the exception of the years 1871 and 1872, less rain fell in 1873 than in any other year since 1866. The aggregate number of hours of rain in 1867 and the six following years being 645 in 1867; 952 in 1868; 978 in 1869; 673 in 1870; 351 in 1871; 298 in 1872; and 472 in 1873. Save and except in September 1869, 75 hours rain in last September was the highest number registered in that month of any year since 1866, and 2 in November the least recorded in any month during the same period. The scarcity of rain in the month of June 1873 was unusual, and the drought experienced in consequence equalled by none since 1864. The disparity is best shown by the following numbers of hours of rain in the month of June for the past seven years:—In 1867, 113; in 1868, 117; in 1869, 130; in 1870, 102; in 1871, 30; in 1872, 104; and 35 in 1873. The number of gales in 1873 amount to 20—3 in excess of 1872. A storm of unusual violence, and the hardest blow of the year, passed over this district in the beginning of January; considerable damage was done to native vessels, and many were totally lost. Several typhoons have been experienced to the southward and eastward of the Yang-Tez Cape, and on the coast of Japan, though none have passed over this locality. The prevailing winds for corresponding months may be said, as a rule, to be almost the same every year, and the steady breezes during the first three weeks of July 1873, travelling at the rate of from 21 to 40 miles an hour, as also the light and variable airs of November last, were exceptional.

NOTE.—The instrument from which the barometrical observations were taken is a Fortin's standard of ·50 inch bore, No. 287. It is placed about 16 feet above the river level. Highest rise during spring tides is from 11 feet 6 inches to 12 feet.

"Notes regarding a remarkable, and very severe, Hailstorm, which occurred in the neighbourhood of Pietermaritzburg, the Capital of the Colony of Natal, on the 17th of April, 1874." By the Rev. J. Digges LA TOUCHE. (Communicated by the PRESIDENT.)

[Received June 6th, 1874.]

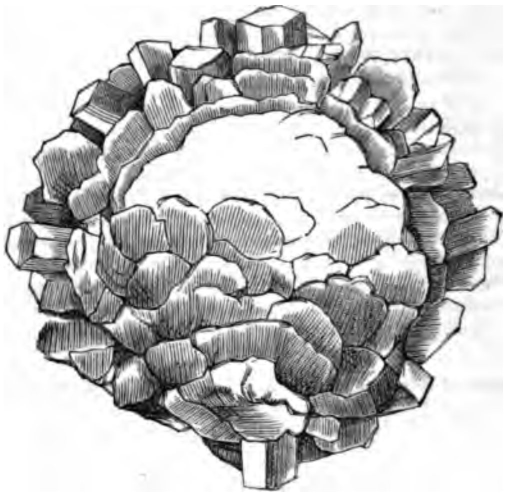
The morning of the day of the occurrence was clear and fine until an hour-and-a-half after noon. The sky immediately overhead then became rapidly obscured by vapour. A sound was shortly afterwards heard, which increased in a brief time, until it amounted to a continuous roar. Hailstones, about the size of marbles, at first fell at intervals, after the fashion of the large drops or splashes of rain that sometimes fall, few and far between, on a summer's day in England. These first "hailstones" of moderate dimensions were soon succeeded by considerably larger ones, accompanied by a light misty rain. The storm was at its height at 2h. 20m. p.m. Stones of enormous size were at that time being dashed to the ground in vast numbers. The large masses of ice descended almost perpendicularly from the upper regions of the air, and struck the earth with great force. Some idea may be formed of the intervals which intervened between the stones at this period, from the fact that a cat ran about after the large white balls that were rolling on the ground without being herself touched by the stones until nearly the end of the storm. The average distance between the larger stones seemed to be some 3 or 4 yards. There was no thunder or lightning during the first part of the storm. The roaring sound seemed to be connected with the passage of the stones through the air, as it unquestionably increased in intensity with the size of the stones.

Towards the end of the storm there were a few flashes of lightning, attended by loud thunder. The rain, which had been throughout so slight as scarcely to wet the ground, then ceased: the storm passed suddenly away, and the sky became clear and calm, the chief trace left of the occurrence being the wreck of the roofs of the city, which strewed the streets in every direction. The roof of

a house occupied by Major Dartnell, situated about two miles from the city, where the storm seemed to exert its greatest violence, was completely destroyed.

In several instances the hailstones passed through sheds of corrugated iron. Horses and cattle were quite unmanageable during the storm, and rushed about in wild confusion, sorely perplexed at the pitiless and incessant pelting to which they were subjected.

In several instances the hailstones weighed more than a pound and-a-half. Most of the stones were white spheroidal masses, obviously composed of a number of smaller masses, of similar character, united together, and with hollow depressions upon the surface. When these spheroidal masses were examined in section, it appeared that they were made up of three or four concentric layers of ice, arranged like the coats of an onion, and alternately dark and white. Other stones, less symmetrical in form, had the surface studded over with massive, but irregularly shaped, crystals of ice. In one instance, which is sketched in the accompanying figure, the ice-prisms surrounded the mass in one particular plane. But in this hailstone the internal structure was also that of concentric layers.



The crystalline form of this hailstone acquires additional interest when it is compared with the more fully developed form of the same type of hailstones figured and described by Professor Abich in a paper of which an abstract was published by Mr. Scott, F.R.S., in the 'Geological Magazine,' January, 1870. A fuller account of the same phenomenon is given in "Materialien zu einer Klimatologie des Kaukasus," by A. Moritz, Tiflis, 1871.

Another witness, Mr. Dunn, has given also a very graphic description of this storm in the 'Cape Argus,' in which he says:—"A loud rushing sound came from the south-west, and then hailstones, liberally mingled with great masses of ice of irregular forms, poured down with great violence. The hailstones were seldom less than one inch in diameter; the average was from one-and-a-half to two inches in diameter. These were of very regular spherical form, and consisted of a nucleus of white snow, with an envelope of hard, transparent ice. Sometimes they presented, when broken through, a concentric arrangement of zones, alternately white and opaque, and transparent. The irregular masses were formed of a nucleus generally longer in one direction than the others, from two to four inches in diameter, and with stalactites projecting all over, each one about the thickness of a little finger, and presenting, when broken across, an agate-like structure, as though built up by aggregation." Mr. Dunn states that he weighed several of the masses, and that three were over 8 ounces: two over 6 ounces; and one over 4 ounces. Other authorities gave 8, 7½ and 6 ounces as the weights of individual masses. The storm raged in full fury for about eight minutes, the road being completely covered as by snow, and the lumps broke into fragments as they struck the ground. Stones went clear through plates of corrugated iron, as if they had been made of paper.

The PRESIDENT declared the Ordinary Meeting closed, after which a Special General Meeting was held, at which a revised form of the Bye-Laws was submitted by the Council.

It was proposed by Mr. COBB, seconded by Mr. BIRT, and resolved, "that the Bye-Laws, as submitted, be adopted, subject to a revision as to certain grammatical alterations by a Committee, consisting of the President and the three Secretaries."

The Meeting then terminated.

DONATIONS RECEIVED FROM JULY 1ST TO SEPTEMBER 30TH, 1874.

Presented by Societies, Institutions, &c.

th	Natural History and Antiquarian Field Club.	Proceedings, Vol. iii. No. 1.
rlin	Kaiserliche Admiralität Hydrographisches Büreau.	Bericht über Wetter-Telegraphie und Sturmwarnungen abgestattet an den Meteorologischen Congress in Wien von dem dafür auf der Leipziger Conferenz ernannten Comité.
ussels	Académie Royale	Annuaire, 1874.
	"	Bulletins. Second série. Tomes xxxv.-xxxvi. 1873.
	Observatoire Royal	Annales Météorologiques, 1872, Sept.-Dec.; 1873, Aug.-Dec.
	" "	Observations des Phénomènes périodiques pendant l'année 1872.
dapest	Königl. Ungarishe Central-Anstalt für Meteorologie und Erdmagnetismus.	Jahrbüch, Band ii. 1872. By Dr. G. Schenzl, Director.
lcutta	St. Xavier's College Observatory.	Meteorological Register, January to June. By Rev. E. Francotti, S.J., Director.
ristiania....	Det Norske Meteorologiske Institut.	Vejledning til Udforelse af Meteorologiske Iagttagelser ved det Norske Meteorologiske Instituts Stationer, 1871. By Dr. H. Mohn, Director.
penhagen ..	L'Institut Météorologique Danois.	Bulletin Météorologique du Nord, June 1 to August 31. By Capt. N. Hoffmeyer, Director.
racow	K. K. Sternwarte	Meteorologische Beobachtungen, June. By Dr. F. Karlinski, Director.
dinburgh	Scottish Meteorological Society.	Journal, Nos. 41-42.
iume	I. R. Accademia di Marina	Meteorological Observations, May.
Hamburg	Norddeutsche Seewarte ..	Jahres-Bericht, 1868 to 1873.
	" " ..	1188 Reisen deutscher Dampfer zwischen dem Kanal und New York.
	" " ..	Ueber die wissenschaftlichen Ergebnisse der ersten deutschen Nordfahrt von 1868.
	" " ..	Nordwestdeutscher Wetter-Kalender.
	" " ..	Ueber die Dampferwege zwischen dem Kanal und New York nach den Journal-Auszügen der Dampfer des Norddeutschen Lloyd in den Jahren 1860-1867 nebst Wind und Wetter in derselben zeit.
	" " ..	Die Normalwege der Hamburger Dampfer zwischen dem Kanal und New York, nach dem Journal-Auszügen derselben in den Jahren, 1860-1869.
	" " ..	Winde, Oberflächentemperaturen und Strömungen im Nordatlantischen Ocean, December (Chart).

Hamburg	Norddeutsche Seewarte .. (continued)	Die Praxis der Methode der Quadrate für die Bedürfniss fänger bearbeitet. Von W. den. Erster Theil.
	" " ..	"Hansa," Vol. i., No. 1; ii., 3 85, 88; v., 113, 114, 118 144; vii.; viii., 1, 2, 6, 8, 1 26, 27; ix.; x. By W. von Freeden, Direct
Klagenfurt	Observatory	Meteorologische Beobachtungen
London	General Register Office ..	Weekly Returns of Births an 1874, Nos. 25 to 37.
	" "	Quarterly Return of Marriag and Deaths, June 30th. By the Registrar-General.
	Meteorological Office	Daily Weather Reports and Cha
	" "	Report of the Meteorological C of the Royal Society for the y 31st December, 1873.
	" "	Report on Weather Telegraphy a Warnings presented to the logical Congress at Vienna b mittee appointed at the Lei ference. By the Meteorological Com
	Royal Society	Proceedings, Nos. 153, 154.
Madras	Government Observatory	Weekly Meteorological Results, 2nd to June 12th.
Milan	Reale Osservatorio Astronomico.	Osservazioni Astronomiche e Fis grande Cometa del 1862 (1 Con alcune reflessioni sulle determinano la figure delle c generale, di G. V. Schiaparell
	" "	Osservazioni di Stelle Cadenti f stazioni Italiane durante l' an
Modena	Reale Osservatorio	I Venti Impetuosi. Lettura de Ragona.
	" "	Nota Relativa a una Cronaca di I Lettera al Conti Ing. G. Vime Tempesta dei 13-16 Aprile 1 guita da una relazione de Mina-Palumbo sulla pioggia ro in Castelbuono il 14 Aprile 18
Norwich	Norfolk and Norwich Naturalists' Society.	Transactions, Vol. i. 1869-74, wi ment.
Oxford	Radcliffe Observatory....	Results of Meteorological Obs 1872. By Rev. R. Main, F.R.S., Observer.
Paris	Observatoire National ..	Bulletin International. By M. U. J. Le Verrier, Dir
	Observatoire Physique Central de Montsouris.	Bulletin Mensuel, June to Augu By M. Marié Davy, Director
	Société Météorologique de France.	Annuaire. Tableaux Météorologi feuilles 1-5.
	" "	Annuaire. Bulletins des Scien feuilles 6-18; 1873, 1-5.
Rome	Osservatorio del Collegio Romano.	Bulletino Meteorologico, April t
	" "	Studii intorno di Diametri Sol Paolo Rosa, D.C.D.G., Assis Osservatorio Pontificio del Co mano. By Padre A. Secchi, Directo
Sydney	Government Observatory	Meteorological Observations, Ja March. By H. C. Russell, F.R.A.S. ment Observer.

Toronto	Education Office.........	Journal of Education, June to August. By Rev. E. Ryerson, D.D.
	Magnetic Observatory ..	Third Report of the Meteorological Office of the Dominion of Canada for the fiscal year ended 30th June, 1873. By G. T. Kingston, M.A., Superintendent.
Upsala	Observatoire de l'Université	Bulletin Météorologique Mensuel, Vol. vi. Nos. 2-5. By G. Svanberg, Director.
Vienna	K. K. Centralanstalt für Meteorologie und Erdmagnetismus.	Beobachtungen, June and July.
	" "	Jahrbücher, Bände iv.—vi. viii. 1867—1869, 1871. By Dr. C. Jelinek, Director.
	Oesterreichische Gesellschaft für Meteorologie.	Zeitschrift. Band viii., Nos. 11, 18. Band ix., Nos. 13-18.
Washington ..	Smithsonian Institute ..	Annual Report of the Board of Regents, 1872. By Prof. J. Henry, Secretary.

Presented by Individuals.

Cleft, H.	Remarks on the Weather of August at Harbour Grace, Newfoundland (MS.).
"	Notes on the Gale of September 7th at Harbour Grace (MS.).
Cora, Guido	Cosmos, comunicazioni sui progressi più recenti e notevoli della geografia e delle scienze affini di Guido Cora. Vol. ii., Nos. 2-3.
Curtis, John	Meteorological Observations taken at Heaton Chapel, Manchester, for the week ending July 2nd.
Delaney, John	General Meteorological Register for the year 1873, St. John's, Newfoundland.
"	Meteorological Observations at St. John's, Newfoundland, June to August (MS).
Dunlop, W. H.	Abstract of Meteorological Observations made at Annanhill, Kilmarnock, Ayr, during the year 1873.
"	Results of Meteorological Observations made at Annanhill, for the months January to July, 1874.
Forbes, Arthur	Meteorological Summary, Culloden, Inverness, June to August (MS.).
Higgs, Rev. W., LL.D. ..	The Telegraphic Journal and Electrical Review, Nos 34-39.
Hoskins, Dr. S. E., F.R.S.	Meteorological Observations taken at Guernsey, June to August.
Johnson, Rev. S. J., F.R.A.S.	Eclipses, Past and Future; with general hints for observing the heavens. By the Rev. S. J. Johnson, M.A., F.R.A.S.
Loomis, Elias, LL.D.	Results of an Examination of the United States War Maps for 1872 and 1873. By Elias Loomis.
Meldrum, C., M.A., F.R.A.S.	On a Periodicity of Cyclones and Rainfall in connection with the Sun-spot Periodicity. By Charles Meldrum.
Miller, S. H., F.R.A.S. ..	The Fenland Meteorological Circular and Weather Report, Nos. 6-8, July to September.
Mohn, Dr. H.	Luftens Temperatur i og udenfor Christiania samt dens Forandring med Hojden sammesteds. Af H. Mohn.
" "	Bidrag til Ost-Ishavets Klimatologie og Meteorologie. Af H. Mohn.
" "	Praktisk Veiledning til Benyttelsen af de Meteorologiske Telegrammer. Af H. Mohn.
Molloy, Capt. E.	Meteorological Observations taken at Leh, Ladak, October 1873 to March 1874 (MS.).
Nicol, J., M.D.	Annual Report on the Sanitary Condition of Llandudno for the year 1873.

Power, Dr. R. E.	Meteorological Observations at Dartmoor, June to August (MS.).
Rawson, Governor, C.B. ..	Report upon the Rainfall of Barbados, and upon its influence on the Sugar Crops, 1847-71, with two supplements, 1873-4. By Governor Rawson, C.B.
" " ..	Rainfall and Meteorological Observations in Barbados, March 1874.
" " ..	Map of the Daily Rainfall of the Island of Barbados, March 1874.
Sergent, Capt. W.........	Log Book of the Steamship 'Ravenworth Castle,' on a voyage from Liverpool to Boston, Baltimore, and back to Liverpool (MS.).
Silver, S. W.	The Colonies, Nos. 164-169.
Symons, G. J.	Symons's Monthly Meteorological Magazine, July to September.
" "	Gutch's Quarterly Journal of Meteorology and Physical Science. Published under the immediate sanction and direction of the Meteorological Society of Great Britain. Nos. i.-viii., January 1842 to October 1843.
" "	Report on the Meteorology of London and its relation to the Epidemic of Cholera. By James Glaisher, F.R.S.
" "	Liberti Fromondi S. Th. L. Collegii Faloonis in Academia Luvaniensi Philosophiæ Professoris Primarii. Meteorologicorum. Libri sex.
" "	Results of Meteorological Observations at the Observatory, Army Medical Department, Aldershot Camp, during the year 1872. By J. Arnold, A.H.C.
" "	Monthly Statement of Rain fallen in the years 1870, 1871, and 1873, at the Stations on the Manchester, Sheffield and Lincolnshire Railway.
" "	Météorologie. De l'influence de la Lune sur le Temps. Bluette dirigeé contre les Almanachs prophétiques. Par un Marin.
" "	Quarterly Return of Births, Deaths and Marriages registered in Scotland, March 31st.
The Editor..............	Gardener's Chronicle. Vol. ii., No. 32, New Series.
" "	Nature, Nos. 244-256.
Turtle, Lancelot	The Weather at Aghalee during the months June to August.
Von Baumhauer, E. H. ..	Sur un Météorographe Universel destiné aux observatoires solitaires. Par E. H. Von Baumhauer.
Wheeler, Rev. R. F., M.A.	Meteorological Reports of the Tyneside Naturalists' Field Club for the years 1868, 1869, 1870 and 1872. By Rev. R. F. Wheeler, M.A.

QUARTERLY JOURNAL

OF

THE METEOROLOGICAL SOCIETY.

Vol. II. No. 13.

XXIV. *On the Absorption of the Sun's Heat-rays by the Vapour of the Atmosphere.* By the Rev. Fenwick W. Stow, M.A., F.M.S.

[Received May 20th. Read June 17th, 1874.]

In examining the results of five years' observations of Solar Radiation, taken at seven different stations in England and Ireland from 1869 to the present year, I found decided indications of the connection between the amount of radiation and the absolute amount of vapour held in suspension by the air as indicated by the dry and wet bulb thermometers. For example, it appeared that at every station but one the yearly maximum of radiation occurred not in June or July, but in *May*, and generally, a high vapour tension in any month accompanied a low force of radiation, and *vice versâ*. I therefore resolved to test this point in several different ways, of which an account is given in this paper.

The instrument relied on for observations of the intensity of radiation is that commonly known as the "blackened bulb *in vacuo*," consisting of a sensitive thermometer, having the bulb and one inch of the stem coated with lamp-black, enclosed in a glass envelope from which the air is removed by an air-pump. The difference between the indication of this instrument, freely exposed several feet above the ground, and that of an ordinary thermometer placed in the shade of a double louvre-board screen at the same height, was found by careful experiment to give a measure of radiation which was comparable within 3 per cent. with that given by a Herschel's actinometer. (See 'Quarterly Journal of the Meteorological Society' for April, 1873.) Observations thus taken may therefore be assumed to be fairly accurate.

In order, then, to test the connection between direct Solar Radiation and the vapour present in the atmosphere—a connection which may be certainly

assumed to exist, from what is known of the powers of aqueous vapour to absorb heat-rays from other sources than the sun—three different modes of investigation have been tried.

(1) Selecting the ten days in each month on which Solar Radiation was most powerful, it is found that the elastic force of aqueous vapour, as calculated from observations of the dry-and wet-bulb hygrometer taken at 9 a.m., is less on these days than the average tension at that hour for the whole month. This was the case at all the three stations selected for the investigation, viz. Strathfield Turgiss in Hampshire, Harpenden in Hertfordshire, and Hawsker, near Whitby, Yorkshire. The figures will be seen in Tables I. II. and III. There are some exceptions, however. In the case of 3 months out of 25 at Hawsker, and 13 out of 57 at Strathfield Turgiss, the tension of vapour for the whole month fell slightly below that on the 10 selected days. At Harpenden, during the year 1872, there were no exceptions; the whole number of exceptions being 16 out of 94. This is easily accounted for when it is remembered that it is not uncommon for the majority of sunny days in a month to be also warm with considerable vapour tension, and there are not always many more than 10 fine days in a month. But on an average the vapour tension on the days of most radiation was ·014 inch at Strathfield Turgiss, ·016 inch at Hawsker, and ·023 inch at Harpenden, lower than the average for the whole month. And in winter, when the absorption of the solar rays is greatest, there was no exception at two of the stations and only one at Hawsker.

But it may be objected that the indications of hygrometers within a few feet of the ground do not tell us with certainty the conditions which prevail above, and unfortunately, no observatory, public or private, has yet been established in this country at any considerable height above sea-level.

(2) But it is an accepted belief, that whatever may be the indications of hygrometers near the surface of the ground, a north wind contains very much less vapour than a southerly one. Accordingly we take the direction of the wind on each of the 10 days of greatest radiation in each month, and work out the relative proportions of N, E, S, or W winds. The figures thus obtained are multiplied by three, to compare them with similar figures for the whole month, such as are found in the Registrar General's Quarterly Reports. The result is that N or NW is the wind most favourable to powerful Solar Radiation at all three stations, which is shown by its greater prevalence on the selected days than on *all* the days of each month. It is a little remarkable, however, that at Hawsker, where N and NE winds blow from the open sea, and therefore contain much moisture, N was a neutral wind as respects Solar Radiation, and NE generally rather unfavourable to it, whereas the NW wind, which is usually dry and cold, was particularly favourable. At Strathfield Turgiss, however, N with but little W in it was the most favourable to Radiation upon the whole, and during the spring months NE had a decided advantage. At Harpenden in 1872, NW was the wind of maximum radiation throughout, although the first half of that year was an exception to the general rule at Strathfield Turgiss. The vane at Harpenden was not well placed to show

TABLE I.

Temperature, Vapour Tension, and Wind at Strathfield Turgiss.

Year.	Month.	9 a.m. Whole Month.						9 a.m. on 10 days of greatest Radiation.						
		Mean Temperature.	Mean Vapour Tension.	Direction of Wind. Relative proportion of				Mean Temperature.	Mean Vapour Tension.	Direction of Wind Relative proportion of				Wind of greatest Radiation.
				N.	E.	S.	W.			N.	E.	S.	W.	
		°	In.					°	In.					
869	July	65·7	·456	5	7	6	13	65·3	·445	8	8	6	9	
	August	62·7	·413	6	11	4	10	61·6	·386	6	12	0	12	
	September	60·7	·418	2	3	8	17	59·8	·390	6	6	6	12	
	October	49·7	·316	9	6	6	10	48·9	·305	14	3	9	5	
	November	42·7	·231	8	1	3	18	42·4	·235	9	0	2	20	
	December	37·0	·196	10	7	6	8	35·1	·171	11	5	5	11	
	Sums or Means	53·1	·338	40	35	33	76	52·2	·322	54	34	28	69	N.
	January	37·9	·203	5	8	6	12	35·3	·179	8	14	3	6	
	February	36·3	·204	7	8	6	7	32·4	·169	11	12	2	6	
	March	40·4	·203	13	8	3	7	37·6	·169	17	9	2	3	
	April	50·7	·256	5	7	6	12	51·8	·271	3	3	3	21	
	May	56·8	·305	8	6	7	10	53·9	·290	9	2	6	14	
	June	63·7	·376	8	2	2	18	62·9	·375	9	2	0	20	
	Sums or Means	47·6	·258	46	39	30	66	45·6	·242	57	42	16	70	N.
	July	64·0	·397	7	6	5	13	65·3	·418	11	5	2	14	
	August	65·7	·369	10	10	3	8	62·5	·373	14	11	2	5	
	September	58·0 ?	·386 ?	3	9	5	13	58·8	·387	5	3	3	20	
	October	50·4	·320	5	6	7	15	50·4	·328	8	8	6	9	
	November	40·1	·219	6	6	8	10	39·5	·217	8	5	3	12	
	December	31·1	·157	10	12	4	5	28·0	·131	12	11	2	3	
	Sums or Means	51·5 ?	·308 ?	41	49	32	64	50·7	·309	58	43	18	63	N.
	January	31·1	·174	7	9	8	7	31·3	·173	6	8	11	6	
	February	41·6	·241	3	4	8	13	41·1	·227	6	6	6	12	
	March	44·6	·237	6	6	9	10	44·5	·224	5	6	3	14	
	April	50·6	·282	4	6	4	16	50·2	·266	9	5	2	15	
	May	54·8	·282	10	11	4	6	52·6	·263	8	14	0	9	
	June	57·3	·356	11	8	4	7	56·2	·330	12	12	2	5	
	Sums or Means	46·6	·262	41	44	37	59	45·9	·247	46	51	24	61	NE.
	July	63·9	·423	3	2	7	19	63·7	·430	3	0	3	24	
	August	67·6	·457	3	10	8	10	67·2	·467	3	5	6	17	
	September	56·0	·351	4	14	5	7	60·7	·376	2	14	6	9	
	October	50·6	·328	4	7	8	12	51·8	·326	6	5	3	17	
	November	38·1	·197	9	12	4	5	35·2	·163	15	6	3	6	
	December	37·5	·203	6	5	8	12	33·8	·174	9	4	6	10	
	Sums or Means	52·8	·326	29	50	40	65	52·0	·322	38	34	27	73	NNW.
	January	39·9	·217	4	4	12	11	38·9	·214	3	3	6	18	
	February	44·4	·269	3	6	13	7	43·7	·260	0	9	11	11	
	March	49·7	·227	5	6	11	9	45·6	·239	2	11	8	11	
	April	50·6	·268	9	5	7	8	51·5	·270	8	6	9	8	
	May	54·1	·294	8	6	5	12	55·5	·257	9	3	2	14	
	June	62·9	·399	4	3	11	12	60·8	·368	8	2	6	15	
	Sums or Means	50·2	·279	33	30	59	59	49·3	·268	30	34	42	77	W.

TABLE I.—*Continued.*

Temperature, Vapour Tension, and Wind at Strathfield Turgiss.

Year.	Month.	9 a.m. Whole Month. Mean Temperature.	Mean Vapour Tension.	Direction of Wind. Relative proportion of N.	E.	S.	W.	9 a.m. on 10 days of greatest Radiati[on] Mean Temperature.	Mean Vapour Tension.	Direction of Wind. Relative proportion of N.	E.	S.	W.	Wind of
		°	In.					°	In.					
1872	July	68·2	·491	3	8	11	9	65·3	·425	6	3	6	15	
	August	63 0	·470	8	8	7	8	63·2	·392	12	8	3	8	
	September	60·3	·405	3	1	8	18	55·9	·328	8	0	6	17	
	October	49·2	·310	5	8	8	10	47·3	·286	3	9	8	9	
	November	45·5	·266	6	4	10	10	44·4	.248	9	2	9	11	
	December	42·0	·243	4	8	11	8	42·3	·240	2	0	14	15	
	Sums or Means	54 7	·364	29	37	55	63	53·1	·320	40	22	46	75	NN
1873	January	41·7	·233	1	6	11	13	38·6	·203	3	3	11	14	
	February	34·5	·188	12	6	4	6	35·9	·182	9	11	5	6	
	March	42·9	·216	6	12	6	7	41·9	·216	11	12	2	6	
	April	49·3	·242	12	9	3	6	50·0	·219	14	12	2	3	
	May....	54·0	·284	11	5	5	10	54·7	·275	11	6	5	9	
	June	60·9	·390	5	7	5	13	62·2	·395	5	8	6	12	
	Sums or Means	47·2	·259	47	45	34	55	47·2	·248	53	52	31	50	NI
	July	65·3	·445	1	3	10	17	65·2	·407	3	2	12	12	
	August	64·6	·430	4	3	7	17	64·3	·424	5	0	5	21	
	September	56·1	·347	7	6	5	12	57·3	·365	8	3	3	17	
	October	48·4	·303	7	6	6	12	48·5	·300	5	5	8	14	
	November	44·4	·241	5	12	5	8	44·8	·241	2	11	8	11	
	December	40·4	·225	5	5	5	16	37·7	·203	3	5	6	17	
	Sums or Means	53·2	·332	29	35	38	82	53·0	·323	26	26	42	92	WS
1874	January	41·4	·231	4	2	9	16	39·9	·210	6	2	9	14	
	February	39·0	·213	7	7	7	7	37·4	·170	9	8	8	6	
	March	44·2	·240	7	4	6	14	44·4	·249	3	5	5	15	
	Sums or Means	41·5	·228	18	13	22	37	40·6	·210	18	15	22	35	I
	Sums or Means	49·84	·2954	353	377	380	626	48·96	·2811	420	353	296	665	NN

E and SE winds correctly, but its exposure was not at all bad from SW to NE. On the whole, taking all three stations together, the wind of maximum Solar Radiation is about NNW. This, I believe, is a true polar wind from the Arctic Ocean. The old belief that the NE wind started from the pole as a N wind, but was deflected by the earth's rotation, is rather the expression of an undoubted tendency than of a fact. I mean to say that, while I entertain no doubt that the influence of the earth's rotation on a body moving in a northerly or southerly direction is the *cause of the wind's rotating round a region of low pressure in the direct n opposite to that of the hands of a watch*,—the explanation, in fact, of Buys Ballot's generalization :—the oppo-

TABLE II.

Temperature, Vapour Tension and Wind at Hawsker.

Year	Month.	9 a.m. Whole Month. Mean Temperature.	Mean Vapour Tension.	Direction of Wind. Relative proportion of N.	NE.	E.	SE.	S.	SW.	W.	NW.	9 a.m. on 10 days of greatest Radiation. Mean Temperature.	Mean Vapour Tension.	Direction of Wind. Relative proportion of N.	NE.	E.	SE.	S.	SW.	W.	NW.	Wind of greatest Radiation.
		°	In									°	In.									
1869	May	46·8	·259	6	9	8	3	1	0	1	3	46·4	·236	6	7	6	0	0	0	3	7	
	June	54·8	·323	9	4	0	0	2	5	2	8	55·2	·315	11	2	0	0	0	6	3	9	
	July..........	63·7	·420	1	1	1	5	3	11	5	4	63·6	·382	3	0	0	0	0	9	12	6	
	August	59·3	·377	6	3	0	0	1	5	7	8	57·2	·373	6	0	0	0	0	6	3	15	
	October	48·2	·293	2	0	1	2	6	11	5	2	47·8	·292	3	0	0	0	3	9	9	6	
	November ..	41·9	·213	6	0	0	2	3	7	7	6	39·3	·209	0	0	0	0	0	6	15	9	
	December ...	37·0	·186	0	1	1	0	2	11	9	5	33·9	·159	3	0	3	0	6	9	3	6	
	Sums or Means	58·6	·345	30	18	11	12	18	50	36	36	57·3	·328	32	9	9	0	9	45	48	58	NW by W.
870	January	36·0	·189	2	2	1	5	10	6	3	2	31·9	·156	0	0	0	3	14	6	8	0	
	February	33·9	·165	0	2	7	6	3	6	2	2	32·8	·149	0	6	6	0	0	3	9	6	
	March	37·4	·191	4	6	3	2	3	4	3	5	33·9	·157	0	6	6	3	3	3	3	6	
	April	48·7	·240	3	0	2	1	4	11	4	5	47·5	·249	6	0	0	0	0	6	6	12	
	May..........	52·0	·295	4	1	2	3	3	12	2	4	47·2	·251	9	0	0	0	0	9	0	12	
	June	56·7	·341	5	0	0	2	2	8	5	8	57·6	·338	3	0	0	0	0	9	9	9	
	Sums or Means	44·1	·237	18	11	15	19	25	47	19	26	41·8	·216	18	12	12	6	17	36	35	45	WNW.
	July..........	62·3	·414	8	1	1	1	4	8	4	4	63·3	·404	6	0	3	3	0	0	3	15	
	August	58·3	·392	16	2	4	1	1	0	0	7	58·5	·384	18	3	0	0	0	0	0	9	
	September ...	55·4	·363	1	4	1	4	5	11	3	1	54·8	·358	0	0	3	3	3	15	3	3	
	October	48·2	·276	1	1	2	4	2	8	7	6	48·8	·276	3	0	6	3	3	6	3	6	
	November	39·3	·227	3	2	0	3	3	11	5	3	38·2	·203	3	0	0	0	6	6	9	6	
	December	34·4	·171	2	4	7	4	1	5	2	6	27·7	110	6	6	0	3	3	4	6	3	
	Sums or Means	49·6	·307	31	14	15	17	16	43	21	27	48·5	·289	36	9	12	12	15	31	24	42	NW by N
1871	January	31·0	·145	0	3	6	4	5	9	1	3	28·5	·130	0	6	0	6	3	9	0	6	
	February	39·9	·216	1	1	2	6	3	9	0	2	42·7	·229	0	0	0	3	3	18	3	3	
	March	43·9	·223	4	0	1	4	5	10	4	2	42·8	·225	3	0	3	0	6	9	3	6	
	April	44·1	·235	6	3	2	5	3	5	3	3	45·1	·235	6	6	3	3	0	0	6	6	
	May	49 5	·277	11	4	2	3	2	3	1	5	47·9	·259	15	6	0	3	0	0	0	6	
	June	51·7	·315	12	5	2	5	2	1	1	2	50·0	·282	9	9	6	3	0	0	0	3	
	Sums or Means	43·3	·235	34	16	15	27	20	37	10	17	42 8	·227	33	27	12	18	12	36	12	30	NW.

site direction for the same reason obtaining in the southern hemisphere, as in the case of the trade winds, which are only an instance of the same tendency on a very large scale:—the Daily Weather Charts seem to me to indicate that the wind which reaches us from the N, NNW, or NW, comes as a rule from the Arctic Ocean, whereas the NE wind comes from Sweden and Russia, and is, in consequence, bitterly cold in February and March, but frequently hot in August. In the spring months, accordingly, we find (Table I.) that the dry cold of a NE wind is highly favourable to radiation; but during the rest of the year the constant coolness and purity of the N and NW winds are accom-

TABLE III.

Temperature, Vapour Tension and Wind at Harpenden.

Year.	Month.	9 a.m. Whole Month.										9 a.m. on 10 days of greatest Radiation.										
		Mean Temperature.	Mean Vapour Tension.	Direction of Wind. Relative proportion of								Mean Temperature.	Mean Vapour Tension.	Direction of Wind. Relative proportion of								Wind of greatest Radiation.
				N.	NE.	E.	SE.	S.	SW.	W.	NW.			N.	NE.	E.	SE.	S.	SW.	W.	NW.	
		°	In.									°	In.									
1872	January	38·7	·217	0	0	0	1	8	13	6	2	37·2	·191	0	0	0	0	3	9	15	3	
	February	41·8	·249	1	1	1	2	4	11	7	2	40·7	·237	0	3	0	3	0	6	12	6	
	March	43·0	·235	2	4	1	3	5	8	4	4	38·2	·191	3	3	3	3	0	0	6	12	
	April	48·0	·265	3	2	1	2	3	6	5	8	46·6	·239	6	0	3	3	3	3	3	9	
	May	49·0	·280	2	10	2	3	0	7	3	2	48·4	·267	0	8	0	4	0	8	6	4	
	June	62·4	·408	0	0	0	2	6	12	6	4	61·1	·367	0	0	0	0	4	13	4	9	
	Sums or Means	47·1	·276	8	17	5	13	26	57	31	22	45·4	·249	9	14	6	13	10	39	46	43	NW by W.
	July	65·2	·443	0	0	0	2	3	13	5	8	62·8	·400	0	0	0	0	0	5	15	11	
	August	61·1	·400	3	0	3	2	2	7	6	8	59·8	·400	3	0	0	0	0	3	12	12	
	September	57·1	·362	1	0	0	1	1	10	11	6	56·9	·341	3	0	0	3	0	6	9	9	
	October	48·0	·300	2	2	0	1	3	12	6	5	46·4	·274	3	0	3	0	0	9	6	9	
	November	43·1	·250	1	3	1	0	4	13	5	2	43·3	·250	0	6	0	0	3	12	0	9	
	December	40·3	·228	2	1	3	1	5	11	3	4	38·0	·205	6	3	0	0	0	12	3	6	
	Sums or Means	52·5	·330	9	6	7	7	18	66	36	33	51·2	·311	15	9	3	3	3	47	45	56	NW by N.

panied by the most powerful sunshine. This certainly appears to show the nature of the connection between solar radiation and the absolute amount of vapour contained in the air.

(3) But, further, if this connection holds good, we necessarily expect to find the amount of solar radiation changing with the season, independently of the alteration of the sun's altitude. If we could either correct the figures for each month for the varying elevation of the sun above the horizon, or obtain a set of figures representing the change in radiation due to this cause alone, we should by a comparison of the two sets of figures obtain an insight into the seasonal change alone. Unfortunately, in the heat reflected from clouds we have a disturbing element which renders the observations of solar radiation in ordinary weather less suitable for this purpose, because cumuli do not occur in winter, and all modifications of cloud are less frequently present in fine weather at that season than in summer. It seemed best, therefore, to endeavour to find the radiation corresponding to different altitudes of the sun on a cloudless day on which the vapour tension was nearly constant, and to compare the figures thus obtained with those obtained in cloudless weather at all times of the year and with various amounts of vapour tension.

April 19, 1878, was a suitable day for the purpose. It was cloudless and clear, with a bitter E wind and a vapour tension of only 0·2 inch. A number of observations were therefore taken of the force of solar radiation, simultaneously with those of the dry and wet bulb hygrometer, the sun's

TABLE IV.—HAWSKER, 1869-1871.

Year.	Month.	On Days Cloudless about Noon. Radn. due to Sun's altitude at noon (1)	Mean Amount observed.	Number of days cloudless.	Temperature at 9 a.m.	Vapour Tension at 9 a.m.	Departure of Radn. observed from (1)	Departure of Vapour Tension from 0·2 inch.
		°	°		°	In.	°	In.
1869	May	56·5	56·9	3	47·5	0·228	+ 0·4	+0·028
	June	57·3	56·0	1	55·2	0·240	— 1·3	+0 040
	July	57·0	51·8	2	65·5	0·458	— 5·2	+0·258
	August......	55·6	42·0	3	76·0	0·561	—13·6	+0·361
	November ..	38·7	33·5	3	44·5	0·218	— 5·2	+0·018
	December ..	31·2	39·5	6	29·0	0·133	+ 8·3	—0·067
1870	January	35·1	39·3	7	30·4	0·144	+ 4·2	—0·056
	March	51·4	53·0	2	32 6	0·132	+ 1·6	—0·068
	April	55·1	49·8	5	47·4	0·204	— 5·3	+0·004
	June........	57 3	53·3	4	60·6	0·354	— 4·0	+0·154
	July	57·0	55·4	5	68·3	0·455	— 1·6	+0·255
	August......	55·6	54·2	3	65·1	0·476	— 1·4	+0·276
	September ..	53·3	49·2	6	57·1	0·350	— 4·1	+0·150
	October	47·9	47·9	3	52·6	0·322	0·0	+0·122
	November ..	38·7	42·8	4	39·0	0·200	+ 4·1	0·000
	December ..	31·2	48·7*	2	22·1	0·068	+17·5*	—0·132
1871	January	35·1	45·9*	3	23·2	0·115	+10·8*	—0 085
	February....	44·7	46·0	2	39·2	0·197	+ 1·3	—0·003
	March	51·4	51·4	2	37 8	0·193	0·0	—0·007
	April	55·1	53·4	2	43·5	0·202	— 1·7	+0·002
	May	56·5	53·8	3	60·5	0·316	— 2·7	+0·116
	June........	57·3	56·5	1	57·0	0·328	— 0·8	+0·128
	July	57·0	55·8	2	61·0	0·399	— 1·2	+0·199
	August ..	55·6	51·8	5	68·9	0·465	— 3 8	+0·265
	September ..	53·3	51·4	3	56·7	0·333	— 1·9	+0·133

* Affected by reflection from snow on ground.

TABLE V.—AVERAGES.

Month.	Hawsker, May 1869 to September 1871. On cloudless days. Radn. due to Sun's altitude at noon (1)	Mean Radiation observed.	Number of cloudless days.	Temperature at 9 a.m.	Vapour Tension at 9 a.m.	Departure of Radn. observed from (1).	Departure of Vapour Tension from 0·2 inch.	Strathfield Turgiss. Aug. 1869 to April 1874. Radn. due to Sun's altitude at noon (2)	Mean Radiation on cloudless days.	Number of cloudless days.	Departure from (2)
	°	°		°	In.	°	In.	°	°		°
January	35·1	40·8*	10	28·2	0·135	+ 5·7*	—0·065	39 2	39·3	10	+0·1
February ..	44·7	46·0	2	39·2	0·197	+ 1·3	– 0·003	47·0	45 8	1	—1·2
March	51·4	52·2	4	35·2	0·162	+ 0·8	– 0·038	52·5	49·7	19	—2 8
April	55·1	50·8	7	46·2	0·203	— 4·3	+0 003	55·6	53·2	20	—2 4
May........	56·5	55·3	6	54·0	0·272	— 1·2	+0·072	57·1	54·4	13	– 2 7
June	57·3	54·3	6	59·1	0·331	— 3·0	+0 131	57·6	55·8	2	—1·8
July........	57·0	54 7	9	66·1	0·442	— 2 3	+0·242	57·5	52·5	7	—5·0
August	55·6	49 8	11	69·8	0·492	— 5·8	+0·292	56·2	55·3	15	—0·9
September ..	53·3	49·9	9	57·0	0·354	— 3·4	+0·154	54·2	49 0	10	—5·2
October	47·9	47 9	3	52·6	0·322	0 0	+0·122	49·7	46·3	10	—3 4
November ..	38·7	38·1	7	39·0	0 209	— 0·6	+0·009	42·1	40·3	15	– 1·8
December ..	31·2	41·7*	8	27·2	0·117	+10·5*	—0·083	36·9	37 0	11	+0 2

* Result partly affected by reflection from snow.

altitude being roughly taken with a sextant. A few more observations were taken on the 21st in similar weather. After waiting nearly three months, another opportunity presented itself on the 7th and 8th of July. The weather was then cloudless and hot, with a southerly breeze, and the tension of vapour was about double that on the previous occasion. A large number of observations were made on the afternoon of the 7th and the forenoon of the 8th, on the same plan as before. The figures thus obtained (See Table VI.) were examined, in order to discover, if possible, some law according to which the increase or decrease of radiation took place. A Pouillet's pyrheliometer was also worked with much care and trouble, but with only moderate success, two successive observations often giving discordant results. (Table VII.) It is impossible to work the beautiful little instruments made by Mr. Casella, without removing them into the shade after each observation, because if they are merely turned away from the sun according to the instructions which are found in Professor Tyndall's work, 'Heat as a Mode of Motion,' they take in heat nearly as fast from the side as they had done from the end which was directed to the sun. Probably the original water instrument of M. Pouillet was, for reasons which need not here be gone into, a much more serviceable actinometer. An improved instrument of this kind is in process of manufacture.*

Relying, then, only on the results obtained from the solar thermometer, it remains to give theoretical expression, if possible, to the figures actually obtained—to find, in fact, a theoretical curve of radiation which shall coincide at least approximately with the curve obtained by experiment.

It may be assumed that the proportion of radiation absorbed by the atmosphere varies according to the length of the path which the beams have to traverse after first entering the earth's atmosphere. If the surface of the earth were flat and the air spread out in a level layer upon it, the length of this path, assuming it to be a straight line and neglecting refraction, would vary as the cosecant of the angle of the Sun's elevation above the horizon. And we may expect to find this approximately true when the altitude of the sun is considerable.

If then l' be this length of path, h the height of the atmosphere, and θ the angle of the sun's altitude, we have $l'=h \operatorname{cosec} \theta$ (1).

Proceeding tentatively, we find that if 69° be assumed as the absolute maximum of radiation, and 10° the amount intercepted by the atmosphere if the sun were vertical, the values calculated agree closely with those observed on the 19th April for angles of 25° and upwards; and similarly, assuming of course the same possible maximum, but taking the amount intercepted if the sun were vertical at 13°, we have an agreement between the calculated values and the July observations down to an angle of 30°.

In order to complete the calculation, it is necessary to find some means of correcting the formula for the shortening of the path of the rays through the

* It is now completed, and so far as it has been yet tried, seems likely to act well.—*January* 1875.

Hour.	Sun's observed altitude.	Cosecant of altitude.	Calculated amount of Radiation (max =69°) (1)	(2)	Observed amount of Solar Radiation. a.m.	p.m.	Mean	Difference of calculated and observed Radiation. from (1)	from (2)	Vapour Tension. a.m.	p.m.	Temperature of Air. a.m.	p.m.
			°	°	°	°	°	°	°	In.	In.	°	°
Noon	48° 0′	1·35	55·5	55·5	56·5	55·8	56·1	− 0·6	−0·6	·230	·225	58·5	59·0
11 a.m. and 1 p.m.	45° 30′	1·40	55·0	55·1	55·4	54·8	55·1	− 0·1	0·0	·214	·200	57·0	60·2
10 a.m. and 2 p.m.	41° 0′	1·52	53·8	54·0	55·0	53·0	54·0	− 0·2	0·0	·210	·200	55·0	60·0
9.30 a.m. and 2.30 p.m.	37° 30′	1·64	52·6	52·9	52·8	52·7	52·7	− 0·1	+0·2	·210	·210	52·5	59·5
9 a.m. and 3 p.m.	33° 30′	1·81	50·9	51·4	52·0	49·0†	50·5	+ 0·4	+0·9	·210	·206	51·0	62·0†
3.30 p.m.	30° 0′	2·00	49·0	49·7	..	48·0†	48·0	+ 1·0	+1·7	..	·202	..	61·0†
3.45 p.m.	28° 0′	2·13	47·7	48·5	..	46·0†	46·0	+ 1·7	+2·5	..	·200	..	61·0†
4 p.m.	26° 30′	2·24	46·6	47·6	44·7†	45·4	45·1	+ 1·5	+2·5	..	·200	60·8†	57·4
4.15 p.m...	24° 15′	2·43	44·7	46·3	42·8†	46·0	44·4	+ 0·3	+1·9	..	·190	60·4†	56·2
4.30 p.m.	21° 0′	2·79	41·1	43·2	42·2†	44·0	43·1	− 2·0	+0·1	..	·189	60·0†	56·0
4.45 p.m.	19° 30′	3·00	39·0	41·5	.	42·1	42·1	− 3·1	−0·6	..	·189	..	55·4
5 p.m.	17° 30′	3·33	35·7	39·0	.	40·2	40·2	− 4·5	−1·2	..	·188	..	55·0
5.15 p.m.	15° 30′	3·74	31·6	36·8	36·8†	37·6	37·2	− 5·6	−0·4	..	·181	58·0†	54·2
5.30 p.m.	13° 0′	4·44	24·6	32·2	..	34·7	34·7	−10·1	−2·5	..	·190	..	53·3
5.45 p.m.	10° 0′	5·75	11·5	25·8	31·0†	30·7	30·8	−19·3	−5·0	..	·190	56·0†	52·3
6 p.m.	7° 30′	7·65	−7·5	19·5	27·5†	28·0	27·7	−35·2	−8·2	..	·200	55·5†	51·8

Observations made from 8 a.m. on 7th July, to Noon on 8th, 1873.

Hour.	Sun's observed altitude.	Cosecant of altitude.	Calculated amount of Radiation. (1)	(2)	Observed amount of Solar Radiation. a.m.	p.m.	Mean.	Difference of calculated and observed Radiation. (from 1)	(from 2)	Vapour Tension. a.m.	p.m.	Temperature of Air. a.m.	p.m.
			°	°	°	°	°	°	°	In.	In.	°	°
Noon	62° 0′	1·13	54·4	54·4	..	54·6	54·6	−0·2	−0·2	·440	·442	..	76·0
11 a.m. and 1 p.m.	59° 0′	1·17	53·8	53·8	54·0	..	54·0	−0·2	−0·2	·435	..	74·0	..
10 a.m and 2 p.m.......	54° 0′	1·26	52·6	52·6	52·0	53·0	52·5	+0·1	+0·1	·368	·382	70·0	74·0
9 a.m and 3 p.m	46° 0′	1·39	50·9	51·0	50·0	51·5	50·8	+0·1	+0·2	·377	·358	69·0	74·0
8.45 a.m. and 3.15 p.m.	45° 0′	1·41	50·6	50·7	49·5	50·8	50·2	+0·4	+0·5	·360	·355	68·0	75·0
8 a.m. and 4 p.m.	37° 0′	1·68	47·2	47·5	47·5	47·1	47·3	−0·1	+0·2	·365	..	66·0	74·0
7.30 a.m. and 4.30 p.m.	32° 0′	1·89	44·4	45·0	45·0	44·8	44·9	−0·5	+0·1	·351	·408	64·0	74·0
7 a.m.	27° 30′	2·16	41·0	42·3	42·0	..	42·0	−1·0	+0·3	·358	..	61·0	..
5.15 p.m.	25° 0′	2·37	38·2	39·9	..	42·0	42·0	−3·8	−2·1	..	·390	..	73·0
6.30 a.m. and 5.30 p.m..	22° 30′	2·61	35·1	37·2	40·2	37·0	38·6	−3·5	−1·4	·354	·390	59·0	73·0
6.15 a.m. and 5.45 p.m.	21° 0′	2·79	32·7	35·3	38·0	36·0	37·0	−4·3	−1·7	·389	·403	55·0	73·1
6.8 a.m. and 5.53 p.m...	20° 15′	2·90	31·3	34·3	37·5	36·8	37·2	−5·9	−2·9	..	..	53·5	73·[illegible]
6 a.m. and 6 p.m.......	19° 30′	3·00	30·0	33·3	..	34·3	34·3	−4·3	−1·0	·374	..	53·0	72·8

TABLE VII.

Pouillet's Pyrheliometer, &c., July 7th and 8th, 1873.

Hour	Pouillet. Change in 2 min.	Solar Thermometers. Difference of B. b. *in vacuo* and air temperature.	B. b. *in vacuo*, and silvered bulb in jacket.	Silvered bulb in jacket and air temperature.	Hour.	Pouillet. Change in 2 min.	Solar Thermometers. Difference of B. b. *in vacuo* and air temperature.	B. b. *in vacuo* and silvered bulb in jacket.	Silvered bulb in jacket and air temperature.
a.m.	°	°	°	°	p.m.	°	°	°	°
6.13	4·4	38·0	29·5	8·5	2.48	4·85	51·9	43·1	8·8
6 18	4·2	38·2	30·0	8·2	2.54	4·75	51·6	42·7	8·9
6 23	4·0	38·8	31·0	7·8	3·0	5·5	52 0	42·5	9·5
10.12	6·8	52·3	41·5	10 8	3.5	5·1	52 0	42·5	9 5
10.17	6·75	52·4	41 8	10 6	5.20	4·75	41·0	34·1	6·9
11.50	4·75	52·2	42·8	9·4	5.24	4·0	39.2	32·8	6·4
11.55	5·75	52·6	42·9	9·7	5 30	4·1	37·0	30·8	6·2
Noon.	6·4	54 6	44·3	10·3	5.35	3·8	37·0	30·8	6·2
0.9	6·1	55·5	45·0	10·5	5.40	3·85	37·0	30·8	6·2
2 20	6·3	52·0	42·1	9·9	5.45	4·8	35·9	30·1	5·8
2.28	4·0	53·4	43 6	9·8	5.50	5·25	36 6	30·6	6·0
2.33	5·1	52·2	42·9	9 3	5.55	4·15	36·4	30·6	5·8
2.38	4·7	52 8	43·1	9·7	6.1	4·15	34·3	28·8	5·5
2.43	5·5	52·5	43·0	9·5	6 8	5·1	34·0	29·0	5 0

atmosphere which results from the convexity of the earth. In order to do this accurately the effect of refraction must be taken into account, and the investigation would involve a knowledge of the exact height of the atmosphere, and of its constitution in respect of moisture at various heights, which we do not possess. Exact accuracy being therefore unattainable, the rough method here given may suffice practically for angles not less than 10°.

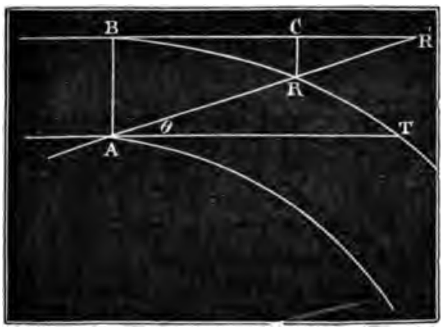


Fig. 1.

Let A be the place of observation

A B the height of the atmosphere $= h$

A R' $= l' =$ uncorrected length of path

A R $= l =$ the true length of path of the beams through the atmosphere

$\angle$ R A T $= \theta$

C R $= d =$ dip resulting from curvature of earth's surface.

$$\text{Then } l' - l = RR' = d \operatorname{cosec} \theta$$

$$\text{but } l' = h \operatorname{cosec} \theta$$

$$\therefore l = (h - d) \operatorname{cosec} \theta$$

but d, the dip, is the square of the horizontal distance B C multiplied by $\frac{1}{8000}$ mile approximately, and BC $= l \cos \theta$, $\therefore d = \frac{1}{8000} l^2 \cos^2 \theta$.

Substituting this value for d, we get the quadratic equation

$$l^2 \cos^2 \theta + 8000\, l \sin \theta = 8000\, h.$$

Putting then the value of h at the commonly received amount, viz. 100 miles, we can work out results for various angles.

Thus: if $\theta = 36° 52'$, $\sin \theta = \frac{3}{5}$, & $l = 163$, l' being $= 167$, & $\therefore \frac{l}{l'} = \cdot 98$

$\theta = 30° \ 0'$, $\sin \theta = \frac{1}{2}$, & $l = 193$, l' being $= 200$, $\frac{l}{l'} = \cdot 96$

$\theta = 19° 28'$, $\sin \theta = \frac{1}{3}$, & $l = 275$, l' being $= 300$, $\frac{l}{l'} = \cdot 92$

$\theta = 14° 29'$, $\sin \theta = \frac{1}{4}$, & $l = 344$, l' being $= 400$, $\frac{l}{l'} = \cdot 86$

$\theta = 11° 32'$, $\sin \theta = \frac{1}{5}$, & $l = 403$, l' being $= 500$, $\frac{l}{l'} = \cdot 81$

$\theta = 9° 36'$, $\sin \theta = \frac{1}{6}$, & $l = 451$, l' being $= 600$, $\frac{l}{l'} = \cdot 75$

$\theta = 7° 11'$, $\sin \theta = \frac{1}{8}$, & $l = 527$, l' being $= 800$, $\frac{l}{l'} = \cdot 66$

According to this the amount of radiation really absorbed should be from 98 per cent. for an angle of 37° to 66 per cent. for an angle of 7°, of the amount calculated from the first formula.

Compare the values thus calculated with those observed, and we find what must be considered a pretty close agreement down to an angle of about 10°. The height of the atmosphere may be vastly greater than 100 miles, but it appears to affect radiation as if it were about that height.

Thus it is possible to construct from theory an approximate curve of radiation for either of the above-mentioned days on the basis of the observed amounts. Such curves are shown in Fig. 2.

We can also construct a curve of diurnal radiation showing the amount of radiation which might be expected to be observed in the middle of each month, if the atmospheric conditions were those of either of these days, and solar radiation were affected only by the alteration in the sun's altitude. For this purpose the observations on April 19th were selected, and the amount of solar radiation on cloudless days calculated on their basis, that is, on the supposition of 10° out of a possible maximum of 69° being absorbed if the sun were vertical. On comparing these figures with the radiation actually observed on cloudless days at Hawsker, we find that in January and December the radiation exceeded the calculated amount in both the years of observation. Cloudless days occurred in only one February, and then the calculation was exceeded. In March, the amount observed once equalled and once exceeded the calculation. In the warmer of two Novembers, the radiation fell below, but in the colder it exceeded the calculated amount. In October it just equalled it, but in all the other months it fell below it, throughout the three summers, showing that in summer a larger percentage of radiation is intercepted than in winter, when the difference in the sun's altitude is allowed for. At Strathfield Turgiss, the calculated amount is on

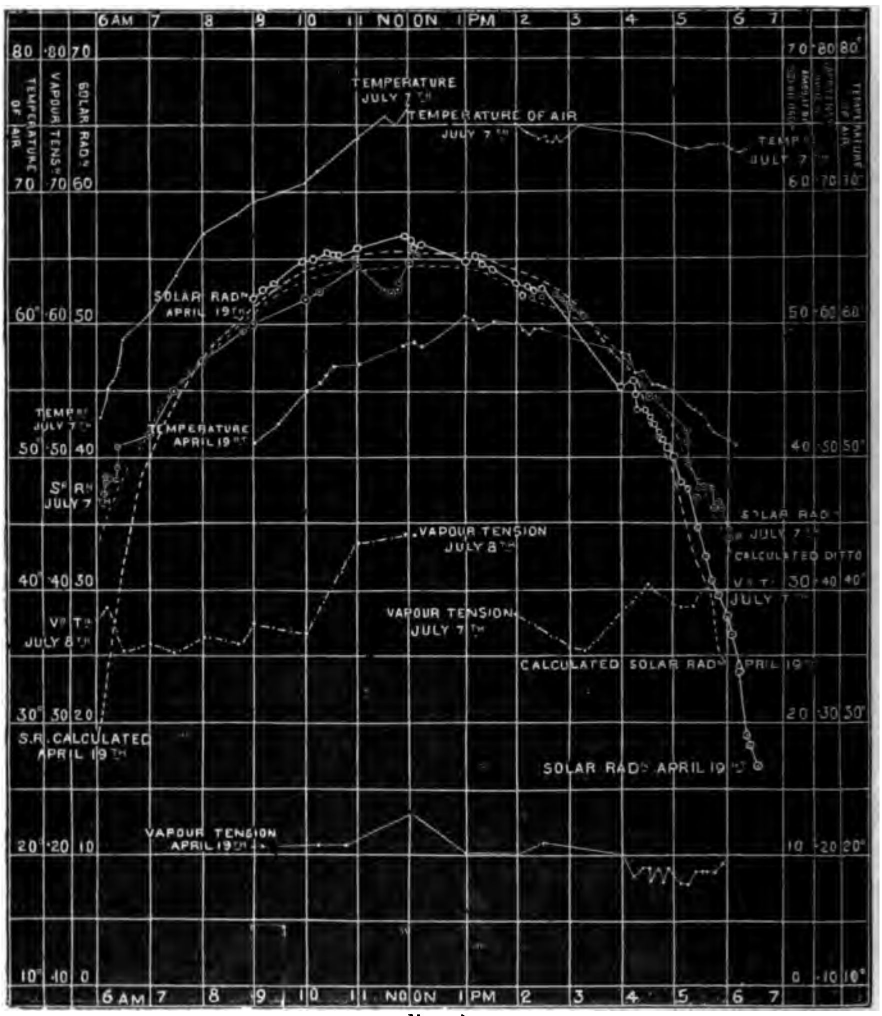


FIG. 2.

an average of five years exceeded only in December and January, and that very slightly, the greatest defect being 5° in July and September, whereas at Hawsker it is nearly 6° in August.

But when the readings of the dry and wet bulb thermometers at 9 a.m. on each of these cloudless days are taken, and the vapour tension worked out, as has been done in the case of the Hawsker observations, we can apply the following crucial test. Since the vapour tension on the 19th April, 1878, at Harpenden was 0·2 inch, all months in which the vapour tension on cloudless days exceeded that amount at Hawsker ought to show *less* than the calculated radiation, and those on which the vapour tension fell short of 0·2 inch ought alone to show an excess of solar radiation above the calculated quantity. To my great surprise, on working out the figures, I found this to be

Radiation in cloudless weather at Strathfield Turgiss, 1869-1874, and Hawsker, 1869-1871. (See Table V.)

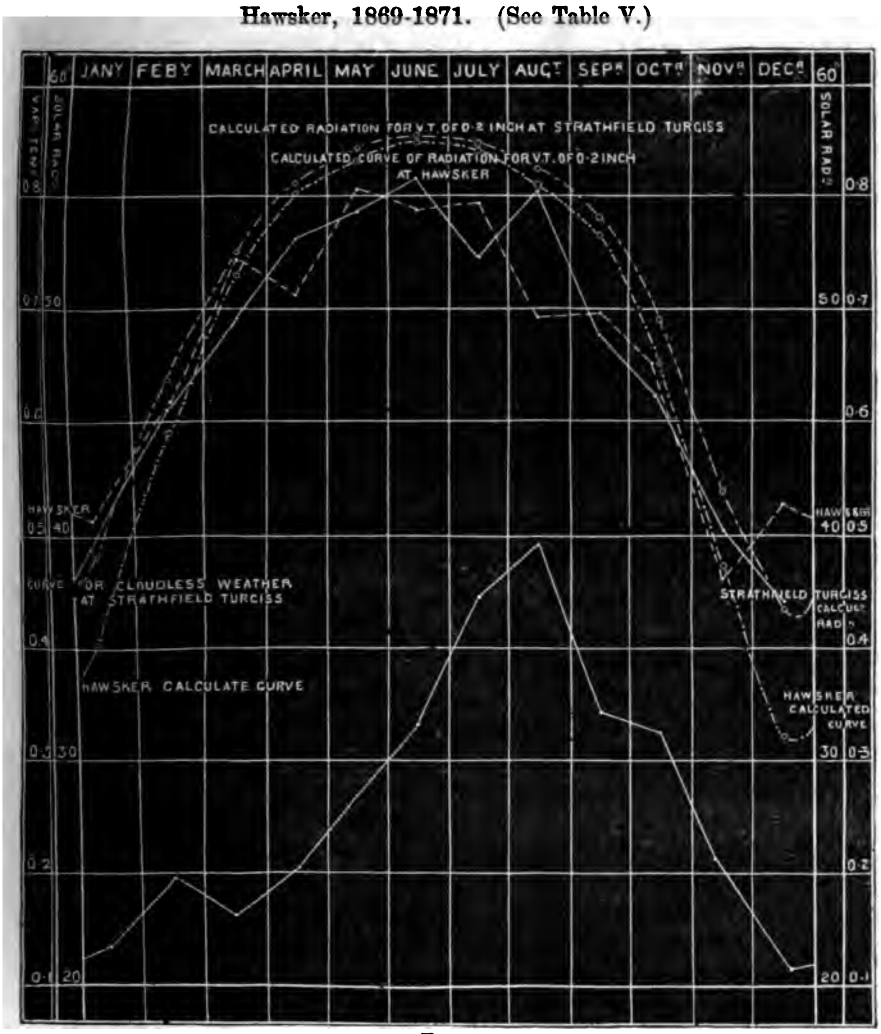


FIG. 3.

exactly true. In the case of some months it is no doubt somewhat fortuitous, and, as might be expected, considerable irregularities occur in the extent of excess or defect in these two elements; but it will be seen in Tables III. & IV. that, with the exception of May, 1869, when both radiation and vapour tension were very near the calculated amount, + in the radiation always answers to — in the vapour tension, and *vice versâ*. The excess of radiation shown in the winter is considerably enhanced by the snow which lay on the ground in December and January 1870-71; but even if 10° is taken off for that, there still is an excess of radiation.

If the conditions prevalent on July 7th and 8th, 1878, at Harpenden, be

taken instead of those of April 19th, and calculation made on the supposition of 13° instead of 10° being absorbed when the sun is vertical, we have a different result, nearly every month showing an excess above the calculated amount. August is the sole exception, and August is the only month in which the vapour tension at Hawsker exceeded the highest tension on July 7th and 8th at Harpenden.

It appears, then, that in our climate, according to the indications of the solar thermometer in clear and cloudless weather, the amount of solar radiation which would be intercepted by the atmosphere if the sun were vertical, rarely exceeds 13° out of a possible maximum of 69°, or about 19 per cent. M. Pouillet, by a somewhat similar process, I suppose, determined it by means of his pyrheliometer to be 25 per cent. This result he seems to have regarded as final and absolute, and not to have inquired whether it was subject to fluctuations. Supposing that he made his observations on a very hot day with high vapour tension, it is likely enough that the amount intercepted would be 25 per cent. Observations on a tropical island would very possibly show 30 or 40 per cent. But in this country 10 or 12 per cent. appears to be approximately the winter minimum, and 20 per cent. the summer maximum of absorption, for a vertical sun, when the sky is free from cloud and mist, or thick haze. It may be observed, that both the absorption of radiation and the tension of vapour in summer are about double those in winter.

What is haze? It can hardly be suspended particles of water, because it occurs usually in hot and dry weather, although its occurrence when rain is coming on with a southerly wind, would seem to favour this notion. Is it particles of dust mechanically suspended? fever germs or cholera seeds? or is it only a non-transparent state of the air consequent on its being unequally heated, and on a constant mixture going on of air of different temperatures? At all events, there is no doubt of its effect upon solar radiation, though the difficulty of measuring its amount prevents us from tracing the exact extent of its influence.

I must notice briefly one other subject of investigation. What increase of radiation is there as we ascend a mountain? That there is an increase is patent to the senses in the case of high mountains. Some determinations of the amount of this increase by means of actinometers have been made by the late Professor Forbes and others on Mont Blanc and other Alpine summits. Extraordinary temperatures have been marked by solar thermometers at a great height; but the mode of exposure was probably not such as to yield comparable results, and care may not always have been taken to shield the instruments from the reflected rays from snow, which would very greatly increase the temperature indicated. But with proper precautions, a solar thermometer may be made to do good service. It can be made quite small, so as to go into the pocket, without giving readings very different from those of one of the ordinary size. It must, however, be carefully compared with the instrument used at the lower station. The chief difficulty is to obtain accurate shade temperature on the top of a hill. An attempt to substitute for it

the readings of thermometers with silvered bulbs in glass jackets, failed from the difficulty of getting them equally well burnished so as to read alike. In the few observations which I have myself been able to make, the pocket solar thermometer, which was made by Mr. Pastorelli, was exposed similarly to the instrument at the lower station, the shade temperature being obtained by fixing a small louvre-board screen to a loose stone wall on the top of the hill. Where it is not possible to do this, a double shield of metal, bright without, but dull within, surrounding the bulb of the thermometer, but admitting of a free current of air, will be found useful. The observations in Table VIII. were taken with the pocket solar and small screen. It was found that the

TABLE VIII.

Increase of Radiation with height.

Time.	On Pen-hill, 1,800 ft. above sea level.					In Valley, 470 ft. above sea level.					Difference of		
	Solar Thermometer.	Shade. Dry.	Shade. Wet.	Amount of Radiation.	Vapour Tension.	Solar Thermometer.	Shade. Dry.	Shade. Wet.	Amount of Radiation.	Vapour Tension.	Solar Radiation.	Temperature of Air.	Vapour Tension.
	°	°	°	°	In.	°	°	°	°	In.	°	°	In.
Feb. 6.—11.15 a.m.	82·0	37·0	..	45·0	..	78·0	35·0	32·0	43·0	·148	+2·0	+2·0	..
11.30 "	83·5	38·0	32·0	45·5	·128	78·2	35·0	32·0	43·2	·148	+2·3	+3·0	—·020
11.45 "	85·0	38·0	31·5	47·0	·121	80·0	35·5	32·0	44·5	·145	+2·5	+2·5	—·024
Noon....	85·2	38·0	31·5	47·2	·121	80·0	36·0	32·0	44·0	·141	+3·2	+2·0	—·020
Max	87·0	39·5	..	47·5	..	81·2	37·1	..	44·1	..	+3·4	+2·4	..
Means ..	84·5	38·1	31·7	46·4	·123	79·5	35·7	32·0	43·8	·145	+2·6	+2·4	—·021
Feb. 23.—11.10 a.m.	80·0	34·0	33·0	46·0	·175	89·0	45·0	40·0	44·0	·197	+2·0	—11·0	—·022
11.20 "	82·2	35·0	33·0	47·2	·166	89·5	45·5	40·5	44·0	·201	+3·2	— 9·5	—·035
11.30 "	85·2	37·8	34·5	47·4	·167	91·5	46·0	40·5	45·5	·198	+1·9	— 8·2	—·031
11.40 "	86·2	38·0	35·0	48·2	·173	93·0	46·2	40·8	46·8	·201	+1·4	— 8·2	—·028
11.50 "	86·8	38·1	34·4	48·7	·163	95·0	46·0	40·0	49·0	·189	—0·3	— 7·9	—·026
Means ..	84·1	36·6	34·0	47·5	·169	91·6	45·7	40·4	45·9	·197	+1·6	— 9·0	—·028

mean difference in solar radiation corresponding to a difference of height of 1330 feet was 2°·6 on the 6th February, 1874, when the sun's altitude was 20° at noon, and 1°·6 on the 23rd February, when the altitude was 26°. Both days were cloudless, clear, and calm. The amount of solar radiation at the lower station was 1°·5 on both days in excess of that calculated for those altitudes of the sun on the basis of the observations in April, 1873, at Harpenden, and the tension of vapour was somewhat less than on that occasion. If the increase with elevation went on above at the same rates as those determined, the maximum possible radiation would have been reached at 13,000 feet in the first case, and at about 20,000 feet in the other. But this is of course not a probable assumption, as no doubt the rate of absorption is most rapid in the lowest regions of the atmosphere. It will be observed, that while on one occasion the temperature of the air was several degrees higher at the top of the hill than below, on the other it was about

10° lower. Nevertheless, solar radiation was a little greater on both occasions at the higher station, and the tension of vapour was less.

But the results of this last investigation must be considered tentative, and liable, in spite of all possible care, to an error of some 0°·5; but they are interesting as far as they go.

Report to the Council of the Meteorological Society regarding the Conference on Maritime Meteorology held in London, August 31st, 1874.—By ROBERT JAMES MANN, M.D., F.R.A.S., President.

[Read at the Ordinary Meeting, November 18th, 1874.]

AT the end of June last, and subsequently to the final Meeting of the Society for the Session, I received an invitation from the Secretary of the Sub-Committee of the Permanent Committee of the Vienna Congress to attend the Meeting of the Conference on Maritime Meteorology appointed to assemble in London on the 31st day of August, and to act in it as the representative of the Meteorological Society. I at once replied to this invitation to the effect that I should have much pleasure in personally assisting at the Meetings of the Conference.

In accordance with this reply, I attended the Meeting of the Conference at the Meteorological Office in Victoria Street, and took part in its subsequent deliberations.

The attendance at the Conference was large, and the Meetings were of considerable interest. The countries that were represented by accredited Delegates at the Conference were:—

France.	Spain.
Germany.	Portugal.
Austria.	Italy.
Denmark.	Turkey.
Norway.	China, and
Russia.	Bengal.
Holland.	
Great Britain, by	
The Admiralty.	
The Board of Trade.	
The Meteorological Society.	

Professor Buys Ballot, of the Royal Meteorological Institute of Utrecht, acted as Chairman; and Captain N. Hoffmeyer, of the Meteorological Institute of Copenhagen, and Mr. R. H. Scott, our own Foreign Secretary, acted as conjoint Secretaries.

Various practical matters were discussed, first in Committee, and afterwards in the full meeting of Conference; and some important Resolutions, arising out of the deliberations, were framed with a view to rendering the

methods and processes of maritime observation more uniform, and in some particulars more exact.

In reference to actual work at sea, it was held that the vessel's course should be expressed in degrees of the circle, rather than in points of the compass, and that records of it should be recorded every 4 hours; that the entire errors of the compass, and not variation only, should be noticed; that the direction of the ship's head, and the vertical heeling of the vessel, should be marked; and that the lettering of the English compass should be universally employed. It was also recommended that the force and direction of the wind should be carefully recorded at two hours' interval; that the Beaufort's scale of estimation should be used; that the barometer should be read to hundredths of an inch, either in decimals of an inch, or in some other suitable equivalent; that the proportion of clouded sky, rather than of clear sky, should be registered; that the occurrence of rain, fog, and snow should be marked in Beaufort's notation; and that the magnitude of sea waves should be given in a numerical scale, and the direction of swell indicated.

It was further suggested that wet and dry bulb thermometrical observations, descriptions of the form of the clouds, the movement of upper cloud strata, and the temperature of the lower depths of the ocean, should be recorded, whenever it was found practicable to do so;—but that these more delicate and difficult observations should not be held to be indispensable. It was also thought that various forms of anemometer should be tried at sea, with a view to determine whether this instrument could be advantageously employed on ship board.

It was unanimously agreed that instruments employed by sailors aboard ship should be of the simplest construction compatible with efficient record, but that they should invariably be of some form accepted and approved by a competent and responsible authority, and that they should always have been compared with established standards, and have had the comparisons registered, the graduation being according to the centigrade scale, and a table to facilitate the conversion of this into other scales being attached to the log-book. It was thought advisable that all instruments should be the property of the Central Office of Superintendence, and that all observations should be methodically checked and supervised. It was also arranged that the English authorised code of instructions for observers should be provisionally issued to Members of the Conference for their deliberate consideration.

It was held to be of high practical importance that all observations should be so discussed and arranged as to admit ready comparison with each other; that results from single-degree squares should, for this reason, be formally tabulated; that all charts expressing results should be confined either to single, or to closely allied elements of observation; and that as a general rule results only, without their correlative discussions, should be presented to sailors. It was also strongly felt that arrangements should be made between distinct and distant Institutions, having the superintendence of meteorological observation, for the organisation and distribution of work.

Considerable attention was given to the question of how far National

Navies might be turned to better account in promoting the prosecution of maritime meteorology as a science. An elaborate, and in some sense almost exhaustive, discussion of this topic was entered upon incidentally and independently by certain Members of the Conference who were connected with naval services, and the results of their deliberations were submitted to the Conference in the form of a series of definite propositions. These were carefully considered in the full Meeting of Conference, and, with the reservation of the paramount necessity of all such questions being held to be fundamentally left in the hands, and at the discretion, of the authorities responsible in the several governments for the administration of naval affairs, the views of these gentlemen were conditionally accepted and endorsed as matters that might advantageously be suggestively communicated to the authorities, with a request for such favourable consideration as could be given them. It was thus agreed that it would be well if the navies of various nations could be brought to adopt as far as possible the principles and practice recommended by the Conference; that the observations made in any navy should be rendered available for comparison and discussion, by being recorded at central and authorised Institutions; that the observations should be of an organised uniform character, should be derived from verified instruments, and should be intrusted to the hands of trained and experienced officers. It was also thought that a more extended range of inquiry could be undertaken on board ships of war than could be ventured upon by the commercial marine; and that on this ground, the record of the velocity of the wind at sea by anemometers,—the employment of rain-gauges and hygrometers afloat,—the examination of superficial and deep currents of the ocean,—and the comparison of the performance of aneroid with mercurial barometers, and of sea observations with records made at neighbouring shore stations,—should be kept prominently in view.

Deep-sea sounding, observation of the temperature and composition of the water at various depths, co-operation with the synchronous observations of the United States Signal Office, and emphatically, the extension of meteorological investigation to outlying and rarely visited regions, were marked as matters that should be continuously pressed upon the attention of the naval authorities and of naval men. A somewhat large section of the Conference, indeed, seemed to go far towards the assertion of the principle that henceforth ships of war should be exclusively used for meteorological inquiry. In deference, however, to the general practice of enlightened communities, and the state of public opinion among the most advanced and civilised nations, any decision of that question was indefinitely postponed.

The London Conference on Maritime Meteorology, on the whole, presented a satisfactory and happy illustration of the advantages that may be secured from this kind of international effort. The results afford a full justification of the anticipation entertained by the Permanent Committee of the Vienna Congress when it proposed the Meeting. The Assembly obviously gave a pleasant and very useful opportunity for men engaged in kindred intellectual pursuits at distant corners of the world, to establish a personal acquaintance

and friendship, and to enter upon a track of future inter-communication and intercourse. Three languages, the English, the French, and the German, were used in the Meeting; but few, if any, of the delegates proved to be unable either to speak their mind, or to understand the mental purposes of their neighbours, in plain English, when they were sufficiently roused to the effort by the interest of debate; and it was very agreeable on such occasions to hear the familiar English tongue interfused with the accents and idioms of nearly all the languages of the civilised world, from the coasts of Scandinavian Norseland to the sunny shores of the Mediterranean sea. The character of the more solid gains that may be hoped for from the gathering has already been sufficiently expressed by the abstract that has been given of the substantial proceedings of the Meeting. The more grave work of the Conference was lightened and varied by the visit of the Delegates to the Observatories of Greenwich, Kew, and the Meteorological Office, and the Arsenal and Ordnance Manufactory at Woolwich, and by a dinner at the "Star and Garter" at Richmond, given to the Conference by the generous hospitality of the Meteorological Committee,—all incidents which largely increased the facilities for friendly communication and intercourse, and which seemed to be fully appreciated and enjoyed by the foreign delegates. It only remains, in conclusion of this Report, to state that as the representative of the Meteorological Society I was careful, in connection with these opportunities, to find occasion to express the keen interest and cordial sympathy which was entertained for the labours of the Conference by the Society, and the deep regret that was felt on account of the Meeting of the Conference having fallen at a time when the Meteorological Society was not in session, and when, from various causes, a large number of its active Members were away, so that no satisfactory Meeting of the Society could possibly be arranged for the official reception of the Members of the Conference.

XXV. *On the Weather of Thirteen Springs.* By R. Strachan, F.M.S.

[Received September 11th. Read November 18th, 1874.]

Summary and Remarks for March.—The length of the middle day of the month is 11h. 50m. The sun is on the equator on the 21st. Temperature rises on a mean by *day* to 48°, and falls by *night* to 36°·7; so that the mean daily range is 11°·3, and the medium temperature 42°, while the mean at 9 a.m. is 41°. The barometer averages 29·854 inches, and the winds give a resultant direction from NW b W. The NE winds are frequent, strong, and dry. The rainfall measures 1·82 inches on 16 days, including snow on 3. The average weather shows 13 overcast days, 16 fine, and 2 very fine; 3 misty and 1 foggy.

The maximum pressure occurred in 1871, with resultant WNW wind, high temperature, and deficient rainfall.

March 1870, and also 1868, had high pressure. 1870 had northerly winds,

low temperature, and excessive rainfall. 1868 had very strong W b S winds, high temperature, rainfall slightly deficient, and very fine weather.

The minimum pressure was in 1862, with southerly winds, the maximum amount and frequency of rain and dull weather, giving a high night temperature.

March 1864, and also 1866, had low pressure. In 1864 the prevalent wind was northerly, the rainfall excessive, and the night temperature low.

In 1866 the winds were chiefly from the W, the rainfall was slightly deficient, and so was the temperature.

Nearly normal pressure was experienced in 1865 with 5 snowy days; in 1867, with snow on 10 days; and in 1869, with snow on 8 days; with temperatures below the mean values, and prevalent NE winds. 1863 had similar pressure, with temperature high, due to WNW winds without snow. The temperature appears to depend much upon the wind, being low for polar and high for equatorial winds.

The maximum temperature was in 1863, with WNW winds, the lowest pressure, the least rainfall, and the finest weather.

The minimum temperature was in 1865, with NNE winds and snow on 5 days.

The strongest westerly winds were in 1861, with low pressure, high temperature, and fine weather. The strongest easterly winds were in 1867 and 1869, with normal pressure, low temperature, dull snowy weather.

The maximum rainfall was in 1862, with southerly winds, and minimum barometer, conditions favourable for high temperature by night, the obscurity of the sky keeping down the heat by day.

The minimum rainfall was in 1863, with NW winds, high pressure and temperature, very fine weather although there were some fogs.

The finest weather was in 1868, with westerly winds, and high temperature.

The most overcast weather was in 1869, with snow on 8 days, easterly winds and low temperature.

Summary and Remarks for April.—The length of the middle day is about 13h. 57m. The sun is advancing to the northern tropic. Temperature rises on a mean by *day* to 57°, and falls by *night* to 42°·5: the mean daily range is consequently 14°·5, and the medium temperature is 50°, the mean at 9 a.m. being 47°·5. There is an increase over March of 8°, while the range is greater by 3°. The mean height of the barometer, at 9 a.m., is 29·996 inches, and the resultant wind WNW. Easterly winds are frequent, sometimes the prevalent. The mean amount of rain, being the least of any month of the year, is 1·33 inches on 13 days. About 10 days may be reckoned upon as overcast, 14 fine, and 6 very fine; mist, fog, and snow are exceptional.

The mean pressures do not seem to be related to the resultant winds, except that when they are above the normal value the winds are chiefly polar, when below the winds are equatorial.

The maximum pressure occurred in 1870, wind resultant NW b W, with normal temperature, minimum rainfall, and the finest weather.

The minimum pressure was in 1872, with NW winds, nearly the average rainfall, and cloudy weather.

The maximum temperature was in 1865, with prevalent ENE winds, high pressure, very little rain and very fine weather.

The lowest temperature was in 1861, with prevalent NW winds, high pressure, and only five rainy days. April 1873 was somewhat similar, but the winds were chiefly from NE, and rain fell on 13 days including snow on 3.

The largest rainfall was in 1871, with prevalent W winds, low pressure, normal temperature, and overcast weather.

The least rainfall was in 1870, and 1865, with high pressure and very fine weather, though as respects wind and temperature they were in contrast.

The strongest WSW winds were in 1867, with low pressure, high night temperature, the most frequent rain, and cloudy weather.

The ENE winds were most prevalent in 1865, with high pressure and temperature, very little rain, and very fine weather.

The finest weather was with the minimum rainfall and maximum pressure, in 1870.

The dullest weather was with the maximum rainfall, in 1871.

The direction of the wind in April does not seem to rule the temperature so much as in the winter months. The temperature probably is more dependent upon the clearness of the sky.

Summary and Remarks for May.—The length of the middle day is about 15h. 35m. The sun is still increasing his north declination. Temperature rises on a mean by *day* to 63°, and falls by *night* to 46°·5, having a mean daily range of 16°·5, being 2° greater than in April and the largest of all the months, and a medium about 55°, or 5° above April. The mean temperature at 9 a.m is 53°·5; pressure 29·99 inches, and resultant wind from WNW. Rain to the amount of 2 inches falls on 12 days. For 10 overcast days there are 17 cloudy and 4 clear; so that, judged by the aspect of the sky, the weather is not so fine as in April, but there is little or no mist, and snow has only been recorded once in May in these thirteen years. Thunderstorms average one per month, being related to the short spells of heat which usually occur in May between the 19th and 25th. The variations in the mean values of pressure are less in this month than in any other. Polar winds are generally experienced, and as often as not they predominate over the equatorial, though they very seldom blow from the south of east. When the resultant wind directions are polar the mean pressures are above the normal; when equatorial, below. The direction of the wind does not appear to rule the temperature.

The maximum pressure occurred in 1861, with northerly winds, but the temperature and weather were normal.

The minimum pressure was in 1869, with prevalent E winds, temperature low by day, rainfall excessive, and weather overcast.

The temperature was highest in 1868, with prevalent SSW winds, the least number of rainy days, and the finest weather.

The temperature was lowest in 1866, with prevalent NE winds, deficient rainfall, and seasonable weather.

Results of Meteorological Observati

Year.	Barometer.	Temperature.			Rainfall.		Notat	
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.	c.
	In.	°	°	°	In.			
1861	29·794	44·0	51·0	39·0	—	—	5	[illegible]
1862	29·684	43·9	48·1	39·8	3·40	22	1	[illegible]
1863	29·905	43·4	52·4	38·6	0·72	11	7	[illegible]
1864	29·693	40·0	47·5	34·5	2·83	18	4	[illegible]
1865	29·906	36·5	42·2	31·3	1·19	16	7	[illegible]
1866	29·721	40·4	47·0	36·2	1·66	16	4	[illegible]
1867	29·820	38·2	43·3	34·1	2·36	17	5	[illegible]
1868	30·007	43·6	50·8	39·0	1·54	18	12	[illegible]
1869	29·826	38·0	43·4	34·3	1·64	20	4	[illegible]
1870	30·041	39·6	46·6	36·0	2·19	13	5	[illegible]
1871	30·066	42·0	51·5	38·7	1·01	13	6	[illegible]
1872	29·822	43·4	49·8	39·2	1·75	16	4	[illegible]
1873	29·820	40·4	48·4	37·0	1·52	18	5	[illegible]
Means	29·854	41·0	47·9	36·7	1·82	16·5	5	[illegible]

Observations of Wind, referred to 16 Poi

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.		S.
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.
1861	1	4·0	—	—	1	2·0	—	—	—	—	—	—	—	—	—	—	2
1862	2	4·0	—	—	1	2·0	2	3·5	5	2·2	—	—	2	3·0	—	—	3
1863	2	3·0	—	—	—	—	—	—	—	—	—	—	1	4·0	3	3·7	1
1864	1	2·0	2	4·5	3	2·7	3	2·7	3	3·0	4	2·0	1	3·0	1	3·0	1
1865	3	3·7	3	2·7	4	3·8	—	—	5	3·4	—	—	1	2·0	—	—	1
1866	3	3·3	1	2·0	6	3·5	1	4·0	—	—	—	—	1	3·0	2	4·5	1
1867	2	2·5	1	2·0	3	3·3	7	2·9	9	3·1	—	—	—	—	—	—	1
1868	4	2·2	—	—	4	1·3	1	1·0	—	—	—	—	—	—	—	—	—
1869	5	3·4	3	2·3	4	2·8	4	2·8	5	4·2	1	2·0	—	—	—	—	1
1870	4	1·8	2	2·0	7	3·3	1	2·0	4	2·8	—	—	—	—	—	—	—
1871	2	3·0	1	3·0	4	2·2	3	2·0	2	2·5	—	—	—	—	—	—	2
1872	2	3·0	1	2·0	3	3·3	—	—	2	2·5	1	1·0	1	3·0	1	2·0	4
1873	2	5·0	1	1·0	4	3·2	4	2·0	8	1·9	1	5·0	1	1·0	—	—	—
Means	2·5	3·1	1·2	2·5	3·4	2·9	2·0	2·6	3·3	2·8	0·5	2·3	0·6	2·8	0·5	3·6	1·3

...r Thirteen months of MARCH in London.

...f Weather at 9 a.m.				Notations of Day's Weather.					
o.	m.	f.	r.	b.	c.	o.	m.	f.	lt.
16	7	1	5	2	20	9	8	—	—
26	8	—	5	—	17	14	4	—	—
11	4	5	—	3	24	4	5	4	—
15	8	—	4	4	12	15	5	1	—
17	3	—	7	1	20	10	1	—	—
20	3	—	2	—	21	10	2	—	—
18	—	—	5	1	18	12	2	—	1
13	1	—	—	5	14	12	2	1	—
20	3	1	3	—	11	20	2	—	—
20	1	—	5	3	12	16	—	—	1
19	7	—	3	4	10	17	3	—	—
19	4	2	—	3	13	15	1	3	—
22	1	—	4	3	16	12	3	1	—
18	4	1	3	2	16	13	3	1	—

...ith mean of force (by Scale 0 to 12).

SSW.		SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms	Resultant.	
o.	F.	o.	F.	o.	F.	o.	F.	o.	F.	o.	F.	o.	F.		Direction.	Force.
1	5·0	3	3·3	1	1·0	11	3·6	6	5·3	3	4·0	1	2·0	1	N 81° W	2·8
1	2·0	6	3·0	1	2·0	2	1·0	—	—	1	1·0	5	2·0	—	S 11 E	0·2
3	3·3	1	4·0	—	—	—	—	4	3·3	9	4·1	3	2·7	4	N 65 W	1·5
1	6·0	3	1·0	3	4·0	3	5·3	—	—	—	—	2	4·5	—	N 11 E	0·2
—	—	1	6·0	4	2·8	3	4·7	2	5·5	2	5·5	1	5·0	1	N 25 E	1·0
3	2·3	2	5·5	1	2·0	9	2·2	1	5·0	—	—	—	—	—	W	0·4
—	—	2	5·5	2	4·0	3	3·0	—	—	—	—	1	2·0	—	N 70 E	1·0
1	3·0	3	2·7	10	3·8	7	3·9	—	—	—	—	1	1·0	—	S 81 W	2·1
—	—	—	—	—	—	6	3·5	—	—	1	3·0	—	—	1	N 83 E	1·2
—	—	1	3·0	4	3·0	4	1·8	2	4·5	1	1·0	1	3·0	—	N	0·9
—	—	1	4·0	3	3·0	7	4·0	—	—	2	2·0	—	—	4	N 72 W	0·8
1	3·0	3	2·7	4	3·5	4	2·0	—	—	—	—	—	—	4	SW	0·5
—	—	2	4·5	2	5·0	4	2·2	—	—	—	—	—	—	2	N 51 E	0·5
0·8	3·3	2·2	3·4	2·7	3·4	4·8	3·2	1·2	4·7	1·5	3·6	1·2	2·7	1·3	N 55 W	0·6

Results of Meteorological Observati

Year.	Barometer.	Temperature.			Rainfall.		Notat	
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.	c.
	In.	°	°	°	In.			
1861	30·176	46·0	53·3	39·2	—	—	8	9
1862	30·030	49·4	54·6	44·5	2·34	14	5	11
1863	30·003	49·7	58·4	43·4	0·71	10	6	14
1864	30·106	48·4	58·9	40·7	0·89	7	11	6
1865	30·156	50·3	63·3	43·4	0·45	5	13	[illegible]
1866	29·937	48·4	56·6	43·0	1·98	16	8	[illegible]
1867	29·820	50·0	56·8	44·5	1·97	22	5	[illegible]
1868	29·939	48·9	56·7	42·9	1·49	14	5	7
1869	30·018	50·5	60·0	44·8	1·17	11	6	8
1870	30·185	47·3	58·7	40·9	0·41	5	9	1[illegible]
1871	29·827	48·4	55·3	43·3	2·75	17	3	5
1872	29·751	47·5	56·8	42·6	1·18	18	3	16
1873	30·000	45·3	54·6	40·3	0·62	13	5	1[illegible]
Means	29·996	47·7	57·2	42·6	1·33	13	7	9

Observations of Wind, referred to 16 Poi

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.		S.
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.
1861	1	1·0	1	3·0	2	2·5	3	1·7	8	2·0	3	2·7	—	—	—	—	1
1862	1	3·0	3	2·3	3	3·3	—	—	—	—	—	—	1	1·0	1	3·0	—
1863	—	—	1	6·0	1	2·0	—	—	2	2·0	1	2·0	2	2·5	—	—	—
1864	3	2·0	2	2·0	2	2·0	2	2·0	10	2·4	—	—	3	1·3	—	—	1
1865	—	—	3	1·3	5	2·4	2	2·5	8	1·8	2	1·5	—	—	—	—	2
1866	1	2·0	—	—	2	2·0	2	2·5	12	3·0	—	—	—	—	—	—	—
1867	1	1·0	2	1·5	—	—	1	2·0	1	2·0	—	—	—	—	—	—	1
1868	6	2·3	3	1·7	5	1·8	1	2·0	2	1·5	—	—	—	—	—	—	1
1869	1	2·0	—	—	1	3·0	3	3·3	7	2·6	—	—	—	—	—	—	1
1870	3	2·0	—	—	1	1·0	2	2·0	6	2·0	1	2·0	—	—	—	—	1
1871	3	1·7	—	—	1	4·0	—	—	6	3·5	—	—	1	2·0	—	—	—
1872	6	2·7	1	1·0	2	3·0	1	3·0	2	1·5	—	—	1	2·0	—	—	3
1873	5	3·0	3	3·7	3	2·7	1	3·0	9	2·3	—	—	—	—	—	—	1
Means	2·4	2·3	1·5	2·3	2·2	2·4	1·4	2·4	5·6	2·4	0·5	2·1	0·6	1·8	0·1	3·0	0·9

hirteen months of April in London.

ther at 9 a.m.				Notations of Day's Weather.					
	m.	f.	r.	b.	c.	o.	m.	f.	lt.
	4	2	1	3	18	9	4	1	—
	1	—	7	3	17	10	3	—	—
	4	1	—	3	21	6	4	—	—
	1	—	2	11	10	9	—	—	—
	5	—	—	13	13	4	3	1	—
	1	1	4	6	11	13	1	—	—
	—	—	5	—	17	13	—	—	1
	1	—	3	1	14	15	1	1	—
	—	—	1	6	13	11	1	—	—
	3	—	—	15	13	2	—	—	—
	—	—	3	1	8	21	—	—	—
	4	—	2	2	19	9	1	—	—
5	—	—	2	7	12	11	—	—	—
4	2	—	2	6	14	10	2	—	—

mean of force (by Scale 0 to 12).

W.	SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms.	Resultant.	
F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
—	1	2·0	—	—	1	1·0	—	—	4	1·8	4	2·3	1	N 52° W	0·9
6·0	5	3·4	2	3·0	4	4·3	2	3·0	5	3·8	1	6·0	1	N 73 W	1·6
4·3	3	2·7	1	7·0	5	3·8	1	4·0	5	3·0	4	4·3	1	N 77 W	1·5
—	1	1·0	2	5·0	4	3·2	—	—	—	—	—	—	—	N 68 E	0·4
1·0	2	2·0	1	2·0	2	3·5	1	2·0	1	1·0	—	—	—	N 65 E	0·6
2·0	2	3·5	3	4·0	6	3·5	—	—	—	—	—	—	1	S 14 E	0·3
3·0	3	4·7	7	5·3	11	3·0	—	—	1	1·0	1	1·0	—	S 73 W	2·6
2·0	3	5·7	1	7·0	6	6·0	—	—	—	—	—	—	1	N 82 W	1·4
—	2	3·5	1	4·0	13	2·8	—	—	—	—	—	—	1	W	0·5
—	2	2·0	—	—	10	3·3	1	3·0	1	4·0	1	2·0	1	N 56 W	0·6
2·0	—	—	4	3·8	11	4·8	2	3·5	—	—	—	—	1	W	1·6
3·5	1	3·0	2	3·5	5	2·0	—	—	—	—	4	3·0	—	N 47 W	0·7
4·0	—	—	—	—	6	3·0	—	—	1	3·0	—	—	—	N 22 E	1·1
3·3	1·9	3·5	1·8	4·5	6·5	3·5	0·5	3·1	1·4	2·8	1·2	3·1	0·6	N 70 W	0·7

Results of Meteorological Obse

Year.	Barometer.	Temperature.			Rainfall.		N
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.
	In.	°	°	°	In.		
1861	30·109	52·8	62·4	46·9	—	—	9
1862	29·905	55·9	63·3	50·6	3·04	16	2
1863	30·041	53·0	61·5	46·0	1·31	11	3
1864	30·016	55·5	65·1	46·4	1·98	11	6
1865	29·953	57·0	66·0	48·6	3·59	18	9
1866	29·997	51·2	60·0	43·0	1·24	11	6
1867	29·910	54·0	63·0	47·0	2·54	12	9
1868	30·031	55·9	68·3	49·8	1·37	6	13
1869	29·830	52·6	59·7	46·2	3·10	18	4
1870	39·081	53·9	65·2	45·6	0·66	7	4
1871	30·100	51·8	64·0	45·0	0·88	8	10
1872	29·929	51·8	61·5	46·0	2·81	16	2
1873	29·981	50·6	61·0	45·4	1·52	14	3
Means	29·991	53·5	63·2	46·7	2·00	12	6

Observations of Wind, referred to 16

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.		
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O
1861	5	2·2	2	1·5	2	1·5	3	3·7	1	3·0	—	—	—	—	—	—	—
1862	—	—	1	5·0	1	3·0	—	—	4	3·0	1	3·0	1	3·0	—	—	
1863	—	—	1	3·0	2	2·0	1	8·0	5	2·8	—	—	1	3·0	2	2·0	—
1864	4	1·5	1	2·0	4	3·5	3	3·7	5	2·0	—	—	—	—	1	3·0	
1865	—	—	1	1·0	2	1·0	—	—	5	2·6	—	—	1	1·0	—	—	
1866	3	1·0	1	6·0	2	3·5	6	3·3	4	2·5	—	—	1	1·0	—	—	
1867	2	4·5	1	1·0	3	2·3	3	2·7	6	2·0	—	—	—	—	1	1·0	
1868	—	—	—	—	4	1·8	—	—	6	3·7	—	—	—	—	—	—	
1869	3	1·3	2	1·5	2	1·5	1	3·0	12	2·8	—	—	—	—	—	—	
1870	4	2·8	1	2·0	—	—	4	2·2	4	2·2	—	—	—	—	—	—	—
1871	4	2·5	1	2·0	6	3·3	4	2·8	4	2·5	—	—	1	3·0	—	—	
1872	3	2·3	—	—	3	1·3	1	3·0	3	2·7	—	—	1	4·0	—	—	
1873	2	1·0	1	2·0	5	2·6	3	2·7	2	4·0	—	—	—	—	—	—	
Means	2·3	2·1	1·0	2·3	2·8	2·4	2·2	3·3	4·7	2·7	0·1	3·0	0·5	2·5	0·3	2·0	1·

hirteen months of MAY in London.

...ther at 9 a.m.			Notations of Day's Weather.					
m.	f.	r.	b.	c.	o.	m.	f.	lt.
—	1	5	2	19	10	3	3	1
2	1	4	—	19	12	1	2	1
—	—	6	2	16	13	4	—	—
4	—	3	4	19	8	—	—	1
—	1	3	10	13	8	—	—	3
—	—	4	4	16	11	2	—	1
2	—	2	5	16	10	—	—	1
2	—	2	12	16	3	—	—	1
2	—	4	1	14	16	—	—	1
1	—	1	4	25	2	1	—	1
1	—	—	7	16	8	1	—	2
2	—	5	—	18	13	—	—	—
—	—	3	3	16	12	—	—	—
1	—	3	4	17	10	1	—	1

mean of force (by Scale 0 to 12).

...W.	SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms.	Resultant.	
F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
—	—	—	—	—	6	2·3	—	—	5	2·4	4	2·5	3	N 15° W	1·3
1·5	4	4·2	3	3·0	4	3·0	3	3·7	2	1·0	1	3·0	2	S 68 W	0·9
4·0	2	5·0	—	—	1	4·0	1	3·0	7	2·4	6	2·7	—	N 20 W	0·6
—	1	2·0	—	—	3	4·3	4	3·5	—	—	2	2·5	1	N 6 E	0·8
3·5	7	4·0	6	4·0	4	2·0	—	—	—	—	—	—	1	SW	1·8
—	1	3·0	6	3·5	3	2·3	1	1·0	—	—	2	1·5	—	N 30 E	0·4
2·3	4	3·3	3	4·7	1	4·0	1	2·0	—	—	—	—	—	S 37 W	0·3
3·0	5	3·2	5	2·0	3	3·3	—	—	—	—	—	—	1	S 18 W	1·0
—	2	5·5	1	3·0	5	3·2	—	—	1	2·0	—	—	—	S 82 E	0·4
—	2	2·5	6	5·0	6	4·2	—	—	3	2·3	1	3·0	—	N 78 W	1·5
—	—	—	3	3·7	4	3·3	—	—	3	3·3	—	—	—	N 14 E	1·0
—	—	—	7	3·3	6	3·3	1	2·0	1	2·0	2	2·0	—	W	1·0
—	—	—	4	2·8	9	2·9	—	—	2	3·0	2	2·0	—	N 71 W	0·9
2·9	2·2	3·7	3·4	3·5	4·2	3·1	0·8	3·0	1·8	2·4	1·5	2·4	0·6	N 70 W	0·4

The largest rainfall was in 1865, with prevalent SW winds; nevertheless the pressure was only a trifle below the normal value, the temperature was high and the weather fine, but there were three thunderstorms.

The least rainfall was in 1870, with prevalent W b N winds, high pressure, normal temperature and fine weather.

The equatorial current of air was strongest in 1865, with the maximum rainfall.

The polar current was strongest in 1871, when the rainfall was very deficient, the pressure high, the temperature seasonable but with greater range than usual, and the weather fine.

The finest weather came with SSW winds in 1868, and gave the highest temperature.

The dullest weather was in 1862, with WSW winds and much rain, conditions which gave a high night temperature. Very dull weather prevailed in 1869, with much rain, but the prevalent wind was E, and the day temperature was below the mean.

It will be seen by the Table that for more than half the month the wind blows from the polar side between NW and E. These polar winds prevail during the spring in spells, and at these times ships have been known to leave this country and carry a fair wind with them to the equator. My attention was directed to this matter, as may be remembered, by our President, Dr. Mann; who has himself experienced this persistent wind. It is certainly worthy of investigation by means of synchronous observations year by year, but it receives little elucidation from the observations made at a single station.

Summary and Remarks for Spring.—The medium temperature of this season rises from 42° to 55°; averaging 49°, with a mean daily range of 14°. Rain to the amount of 5·15 inches falls on 41 days, out of the 92 of the season. April, although proverbially showery, is the driest month of the year, and appears to have finer weather even than May. Spring may usually reckon upon 12 very fine days, 47 fine, and 33 overcast. Snow falls on an average on 8 days, chiefly in March; about 5 days are misty, and only 1 foggy. March maintains the character of winter for storms and squalls, but these become markedly less frequent after this month. The mean atmospheric pressure is 29·947 inches, with resultant WNW winds. The mean pressure and resultant winds are about the same for April and May, but pressure is less in March and the winds more northerly. The variation in the monthly mean pressures is less than in winter. The frequency of the winds are, N, 11; NE, 13; E, 17; SE, 8; S, 6; SW, 11; W, 21; NW, 8; calm, 2;—or polar 42, equatorial 48. The polar winds are more frequent in this season than in any other. On the whole, it does not appear that one spring month is subject to these winds more than the others; but they usually last for some time, days or weeks together, so that in some years one month has an undue share compared with the others, while other years bring compensation. The succession from polar to equatorial winds, and back again, is attended sometimes with much severity in the changes of temperature; but it is to be

remarked that the temperature on the whole is not much affected by the direction of the wind. The lower atmosphere is more transparent than in winter, from the absence of mist and fog. Luke Howard remarks that "the temperature commonly rises, not by steady increase from day to day, but by sudden starts; from the breaking in of sunshine upon previous cold cloudy weather." The fair weather wind seems to be the NW in spring. This is curious in relation to the isotherms which, according to Buchan, run in this season from NW to SE over the British Isles. Spring compared with autumn has a higher pressure, more polar winds, a lower temperature but a greater range, and a less rainfall.

Note added November 18th.

I regret that this paper was sent in before I had an opportunity of perusing the article on the Weather of May in Scotland, in 'Good Words' for 1866, by Dr. Arthur Mitchell,—otherwise I certainly should have made a few quotations from his excellent essay, which has the rare merit of being accurate as well as popular. The President having suggested that the references might be put in as notes, they here follow; and it will be seen that they support many of the statements in the paper.

"The great rise of temperature which occurs in May depends on the rapid rate of increase in the power of the sun's rays at this period of the year, and the same influence is stretched over June. It depends on this solely, and not on any greater prevalence of warm winds. Indeed, the very opposite of this holds, for the rise of temperature takes place in spite of the fact that at no season of the year are cold winds more frequent or more steady."

"As regards daily range of temperature May stands apart from all other months of the year in this—that the range culminates in that month. . . . The daily fluctuations are excessive in this month and greater than in any other."

"The course of temperature in one May differs much from that in another, and it seems particularly uncertain and irregular towards the close of the month."

"While examining the meteorological records for May, it was observed that a change of wind from northeast to southwest did not always bring a rise of the daily mean. On the contrary, it sometimes depressed it. The high and increasing temperature of May depends on the increasing power of the sun, and the south wind clothes our sky with a curtain of cloud which both absorbs the sun's heat during the day, and prevents radiation during the night; thus lowering the day temperature and raising the night one."

"The stream from the northeast flows over us in March, April, May and June, during the whole of which period we have the wind nearly as often from the cold northeast as from the warm southwest. It is quite otherwise both in our months of great heat and of great cold, for then the southwest winds have their greatest frequency. Thus it happens that in the very dead of winter, our prevailing winds blow from those very quarters from which

they blow in the height of summer; while in spring and early summer,—when our weather is becoming rapidly warmer and warmer,—keen, cold winds from polar regions stream over us for more than half the time."

"The east wind seldom brings rain in spring."

"It need scarcely be said that these months of northerly winds are sure to be the driest of our year." . . . . "Less rain falls in April, May, and June, and it also falls on a smaller number of days, than in any other months of the year."

"During such weather as that of spring,—characterised by northeast winds, little rain, and a rising temperature—we should expect much sunshine and little cloud. And such is the fact."

"Sunshine and cloud rise and fall respectively in the months of April, May and June, giving us for that time dry, bright, clear days."

DISCUSSION.

Captain TOYNBEE said that there could be no doubt as to the value of such papers as Mr. Strachan's, especially in their relation to the requirements of the various localities for which they were compiled; but that the theory of prevailing winds at certain seasons was so nearly related to the disposition and motion of areas of high and low atmospheric pressure at those seasons, that such areas must be considered before the subject could be satisfactorily dealt with. With regard to the northerly wind experienced by Dr. Mann during the whole of a passage between the Equator and England, he called attention to the fact that there is an area of high pressure to the northward of the NE Trades in the Atlantic, which moves N and S with the sun. In the summer this area lies to the westward of Portugal, or perhaps sometimes further N, causing northerly winds off that coast, so that if a ship started with a northerly or north-easterly wind from the English Channel which carried her to the coast of Portugal, she would be likely to keep that wind until she lost the NE Trades in the Doldrums.

Mr. GASTER said that while studying the Daily Weather Charts he had come to the conclusion that the steady N to NE winds which often prevail over us in May are connected with, or form an extension of, the NE trade. They are often accompanied by N and NW winds on our N and NE coasts.

Mr. SYMONS said that Mr. Strachan, having only dealt with mean monthly values, could not be expected to have referred to any phenomena of a shorter period. As, however, he had been speaking of and working up data for May, he should like him to say a few words upon the disturbance in the normal progression of temperature which occurs in the middle of that month.

Mr. WHIPPLE thought that Mr. Strachan's figures show that the characteristic features of the weather of the months of April and May, according to old sayings, should be reversed.

Mr. SCOTT said that his experience of the cold days in May was that usually an easterly gale was felt at that period, which was generally due to the advance eastwards of an area of low pressure along the parallel of 45° or 46°.

Mr LAUGHTON was inclined to think that the easterly winds of May were the outward manifestation of the change in atmospheric pressure which was then taking place in Asiatic Russia, where the barometer falls from 30·5 in. in January to 29·5 in. in July. Evidently there must be an escape of air from that locality in some direction. He would ask Mr. Scott if he had ever traced our easterly winds of May backwards: if he could say how far to the NE they extended?

Mr. SCOTT said that he could not give a satisfactory answer to Mr. Laughton's question; in fact, it could hardly be answered until the materials for the answer were furnished by the forthcoming publication of the synchronous observations. It had, however, frequently been observed that areas of high pressure had advanced from the eastward—in fact, Dove maintained that cold came from the east. In certain cases, as in February, 1870, such an area had advanced over us, and the result was the heavy south-east storm of February 6, which had

carried away the harbour works at Wick. This was followed in a week by a heavy easterly gale over southern England, and as far as he could recollect it had been stated that the easterly winds were felt out in the Atlantic as far as 40° W. There then was a definite out-flow extending from Central Russia over upwards of 60° of longitude.

In the instance cited by the President, of an east wind prevailing during the entire run from the Equator to the Lizard, he was disposed to think that this circumstance must have arisen from the area of high pressure, at the Horse latitudes, having extended itself in latitude up to 50° N or so, and so having ruled the motion of the current of air, so that the Trade wind appeared to have been prolonged backwards. It was always a difficulty to him, if we suppose the air of the Trade winds to be drawn directly from the frigid zone, to see whence these Trade winds could draw their supplies at a time when the prevalent winds, north of 40° N over the Atlantic and Europe, were westerly.

Mr. STRACHAN concurred with what had been said respecting the geographical distribution of atmospheric pressure and winds; but as the observations which he had discussed referred only to one place, there was no need to reply to these remarks. It was, then, only necessary to reply to Mr. Symons's suggestion. Each of the days from the 11th to the 14th May is a Saint's day according to the calendar, and these saints have been popularly called *frost-saints*, because these days are believed to bring cold weather. Scientifically, they are designated Maedler's cold days, because he showed that at or about this time there usually happens a dip or a tendency to dip in the temperature curve, notwithstanding that its tendency upward is so very decided at this season. It might be thought that this was due to a prevalence of north-east wind; but this could scarcely be the cause, because it is known that in May the temperature is more dependent upon the sun than the winds. It was no part of his plan to examine single days, but he would direct his attention to this question.

Mr. LECKY remarked, in corroboration of what Mr. Scott had said respecting rough easterly weather in the middle of May, that the heaviest easterly gale he remembered in the South of Ireland occurred on the 15th to the 17th of May, 1838.—It began on a Tuesday afternoon, after a bright frosty morning, with fringes of snow from the south-east, the snow increasing and the wind changing to east, blowing a full force of ten, until the 17th, when it moderated.

XXVI. *Table for facilitating the determination of the Dew Point, from Observations of the Dry and Wet Bulb Thermometers.* By WILLIAM MARRIOTT, Assistant Secretary.

[Received October 8th. Read November 18th, 1874.]

I BEG to bring before the Society the accompanying Table for facilitating the determination of the Dew Point from observations of the Dry and Wet Bulb Thermometers, which has afforded me considerable assistance, and has been the means of saving much time, which would otherwise have been spent in numerous calculations, while engaged upon the reduction of observations connected with certain Evaporation Experiments.

It is based upon Table I. in Glaisher's "Hygrometrical Tables," which supplies the "factors by which it is necessary to multiply the excess of the reading of the dry thermometer over that of the wet, to give the excess of the temperature of the air above that of the Dew Point," but differs from it by giving the amount to be subtracted from the reading of the *Wet* Bulb Thermometer instead of from that of the *Dry*. It is only intended for ordinary purposes, and does not profess to be of use for readings below 30° or above 79°, nor for greater differences than 15° between the readings of the Dry and Wet Bulb Thermometers.

Reading of Dry Thermometer.	Difference between Dry and Wet Thermometers.														
	1.0°	2.0°	3.0°	4.0°	5.0°	6.0°	7.0°	8.0°	9.0°	10.0°	11.0°	12.0°	13.0°	14.0°	15.0°
	Amount to be subtracted from the Wet Thermometer to obtain the Dew Point.														
30°	3.2°	6.3°	9.5°	12.6°	15.8°	18.9°	22.1°	25.2°	28.4°	31.5°	34.7°	37.8°	41.0°	44.1°	47.3°
31	2.7	5.4	8.1	10.8	13.5	16.2	18.9	21.6	24.3	27.0	29.7	32.4	35.1	37.8	40.5
32	2.3	4.6	7.0	9.3	11.6	13.9	16.2	18.6	20.9	23.2	25.5	27.8	30.2	32.5	34.8
33	2.0	4.0	6.0	8.0	10.0	12.1	14.1	16.1	18.1	20.1	22.1	24.1	26.1	28.1	30.2
34	1.8	3.5	5.3	7.1	8.9	10.6	12.4	14.2	15.9	17.7	19.5	21.2	23.0	24.8	26.6
35	1.6	3.2	4.8	6.4	8.0	9.6	11.2	12.8	14.4	16.0	17.6	19.2	20.8	22.4	24.0
36	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	19.5	21.0	22.5
37	1.4	2.8	4.3	5.7	7.1	8.5	9.9	11.4	12.8	14.2	15.6	17.0	18.5	19.9	21.3
38	1.4	2.7	4.1	5.4	6.8	8.2	9.5	10.9	12.2	13.6	15.0	16.3	17.7	19.0	20.4
39	1.3	2.6	4.0	5.3	6.6	7.9	9.2	10.6	11.9	13.2	14.5	15.8	17.2	18.5	19.8
40	1.3	2.6	3.9	5.2	6.5	7.7	9.0	10.3	11.6	12.9	14.2	15.5	16.8	18.1	19.4
41	1.3	2.5	3.8	5.0	6.3	7.6	8.8	10.1	11.3	12.6	13.9	15.1	16.4	17.6	18.9
42	1.2	2.5	3.7	4.9	6.2	7.4	8.6	9.8	11.1	12.3	13.5	14.8	16.0	17.2	18.5
43	1.2	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	13.2	14.4	15.6	16.8	18.0
44	1.2	2.4	3.5	4.7	5.9	7.1	8.3	9.4	10.6	11.8	13.0	14.2	15.3	16.5	17.7
45	1.2	2.3	3.5	4.6	5.8	7.0	8.1	9.3	10.4	11.6	12.8	13.9	15.1	16.2	17.4
46	1.1	2.3	3.4	4.6	5.7	6.8	8.0	9.1	10.3	11.4	12.5	13.7	14.8	16.0	17.1
47	1.1	2.2	3.4	4.5	5.6	6.7	7.8	9.0	10.1	11.2	12.3	13.4	14.6	15.7	16.8
48	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8	9.9	11.0	12.1	13.2	14.3	15.4	16.5
49	1.1	2.2	3.2	4.3	5.4	6.5	7.6	8.6	9.7	10.8	11.9	13.0	14.0	15.1	16.2
50	1.1	2.1	3.2	4.2	5.3	6.4	7.4	8.5	9.5	10.6	11.7	12.7	13.8	14.8	15.9
51	1.0	2.1	3.1	4.2	5.2	6.2	7.3	8.3	9.4	10.4	11.4	12.5	13.5	14.6	15.6
52	1.0	2.0	3.1	4.1	5.1	6.1	7.1	8.2	9.2	10.2	11.2	12.2	13.3	14.3	15.3
53	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
54	1.0	2.0	2.9	3.9	4.9	5.9	6.9	7.8	8.8	9.8	10.8	11.8	12.7	13.7	14.7
55	1.0	1.9	2.9	3.8	4.8	5.8	6.7	7.7	8.6	9.6	10.6	11.5	12.5	13.4	14.4
56	0.9	1.9	2.8	3.8	4.7	5.6	6.6	7.5	8.5	9.4	10.3	11.3	12.2	13.2	14.1
57	0.9	1.8	2.8	3.7	4.6	5.5	6.4	7.4	8.3	9.2	10.1	11.0	12.0	12.9	13.8
58	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.0	9.9	10.8	11.7	12.6	13.5
59	0.9	1.8	2.7	3.6	4.5	5.3	6.2	7.1	8.0	8.9	9.8	10.7	11.6	12.5	13.4
60	0.9	1.8	2.6	3.5	4.4	5.3	6.2	7.0	7.9	8.8	9.7	10.6	11.4	12.3	13.2
61	0.9	1.7	2.6	3.5	4.4	5.2	6.1	7.0	7.8	8.7	9.6	10.4	11.3	12.2	13.1
62	0.9	1.7	2.6	3.4	4.3	5.2	6.0	6.9	7.7	8.6	9.5	10.3	11.2	12.0	12.9
63	0.9	1.7	2.6	3.4	4.3	5.1	6.0	6.8	7.7	8.5	9.4	10.2	11.1	11.9	12.8
64	0.8	1.7	2.5	3.3	4.2	5.0	5.8	6.6	7.5	8.3	9.1	10.0	10.8	11.6	12.5
65	0.8	1.6	2.5	3.3	4.1	4.9	5.7	6.6	7.4	8.2	9.0	9.8	10.7	11.5	12.3
66	0.8	1.6	2.4	3.2	4.1	4.9	5.7	6.5	7.3	8.1	8.9	9.7	10.5	11.3	12.2
67	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	8.8	9.6	10.4	11.2	12.0
68	0.8	1.6	2.4	3.2	4.0	4.7	5.5	6.3	7.1	7.9	8.7	9.5	10.3	11.1	11.9
69	0.8	1.6	2.3	3.1	3.9	4.7	5.5	6.2	7.0	7.8	8.6	9.4	10.1	10.9	11.7
70	0.8	1.5	2.3	3.1	3.9	4.6	5.4	6.2	6.9	7.7	8.5	9.2	10.0	10.8	11.6
71	0.8	1.5	2.3	3.0	3.8	4.6	5.3	6.1	6.8	7.6	8.4	9.1	9.9	10.6	11.4
72	0.8	1.5	2.3	3.0	3.8	4.5	5.3	6.0	6.8	7.5	8.3	9.0	9.8	10.5	11.3
73	0.7	1.5	2.2	3.0	3.7	4.4	5.2	5.9	6.7	7.4	8.1	8.9	9.6	10.4	11.1
74	0.7	1.5	2.2	2.9	3.7	4.4	5.1	5.8	6.6	7.3	8.0	8.8	9.5	10.2	11.0
75	0.7	1.4	2.2	2.9	3.6	4.3	5.0	5.8	6.5	7.2	7.9	8.6	9.4	10.1	10.8
76	0.7	1.4	2.1	2.8	3.6	4.3	5.0	5.7	6.4	7.1	7.8	8.5	9.2	9.9	10.7
77	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4	9.1	9.8	10.5
78	0.7	1.4	2.1	2.8	3.5	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0	9.7	10.4
79	0.7	1.4	2.1	2.8	3.5	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0	9.7	10.4

I am indebted to Mr. Rogers Field, B.A., for the suggestion of the method employed in the formation of this Table.

The arrangement of the Table is as follows:—

The first column on the left gives the reading of the Dry Bulb Thermometer for every degree from 30° to 79°. The other columns give, for each degree of difference between the readings of the Dry and Wet Bulb Thermometers, the amount to be subtracted from the reading of the Wet Bulb Thermometer to obtain the temperature of the Dew Point. The amounts for tenths of degrees can of course be at once obtained by merely shifting the decimal point one place to the left.

The following examples will show the manner of using the Table:—

(1.) Suppose the reading of the Dry Thermometer to be ...... = 50°·0
„ Wet „ „ ... = 45°·0
The difference is .... = 5°·0
On looking at the Table, we find the amount to be subtracted from
the reading of the Wet Thermometer is...................... = 5°·3
Therefore the Dew Point is, 45°·0 — 5°·3............................ = 39°·7

(2.) Suppose the reading of the Dry Thermometer to be ...... = 55°·5
„ Wet „ „ ... = 48°·3
The difference is .... = 7°·2

On referring to the Table, we see the amount to be subtracted for 7°·0 = 6°·7, and for 0°·2 = 0°·19, say 0°·2, giving 6°·9 as the total amount to be subtracted from the reading of the Wet Bulb Thermometer.
Therefore the Dew Point is, 48°·3 — 6°·9............................ = 41°·4

DISCUSSION.

Mr. MARRIOTT said that he had found by using this Table that there was a saving of time of 30 per cent., as compared with the ordinary method.

Mr. SYMONS said that when this paper was referred to him, he thought the best way to test the Table was to work out a dozen cases by Glaisher's Tables and then by this, timing himself in each case. The result was a saving of quite the amount stated by Mr. Marriott, and, doubtless, when he was as used to Mr. Marriott's Table as he was to Mr. Glaisher's, the saving would be greater. The results given by this Table were identical with those worked out from Glaisher's Tables, it was merely a simplification.

Mr. FIELD said that the distinguishing feature of this Table was that the Dew Point was arrived at by subtraction from the reading of the Wet Bulb Thermometer, instead of from the Dry, consequently the amount to be subtracted was only about half of that subtracted by the ordinary method, and the liability to error was proportionally reduced. The arrangement of the Table was such that the interpolation could be effected at sight, and consequently the time saved in comparison with the ordinary method was very considerable, and to any one accustomed to the use of the Table, he believed the saving would be at least 30 per cent., if not more.

Mr. GASTER asked whether the Table might not be made more useful by giving the Dew Point Temperature itself, instead of the quantity to be subtracted from the Wet Bulb Thermometer reading?

Mr. MARRIOTT said that he did not think this could be accomplished. If the Dew Point Temperature were given direct, the Table would resolve itself into

Glaisher's Tables, with this exception, that it would not give the differences for interpolating for tenths of degrees. But by the present arrangement the amounts to be subtracted for tenths, as well as whole degrees, could be obtained at sight.

Mr. WHIPPLE referred to a Hygrometrical Slide Rule invented by Mr. Welsh, and described by him in the 'British Association Report' for 1851, as a convenient instrument for use in making calculations of Dew Point, Relative Humidity, &c., and gave testimony to its value, as derived from experience in its constant employment at the Kew Observatory.

Mr. FIELD asked Mr. Whipple whether they had had the graduations on the Slide Rule altered, because he found that the one he possessed did not give the same results as Mr. Glaisher's Tables.

Mr. WHIPPLE said that he had re-calculated the values from which the Rules were divided, and found the earlier ones had been constructed somewhat inaccurately. Probably Mr. Field had obtained one of these,—hence the differences he had observed.

In reply to the PRESIDENT, Mr. WHIPPLE promised to communicate a Paper to the Society, giving his corrections and the results of experiments on the relative facility in computing by Sliding Rule and by Tables.

Mr. SYMONS said it had occurred to him that possibly Mr. Marriott's Table might with advantage be turned into a series of curves similar to the capital one for obtaining Humidity, published by Mr. Russell, B.A., Director of the Observatory, Sydney, New South Wales.

XXVII. *On the Heat and Damp which accompany Cyclones.* By the Honourable RALPH ABERCROMBY, F.M.S.

[Received October 14th. Read November 18th, 1874.]

THE Heat and Damp which accompany Cyclones, are phenomena which are never absent in any part of the world.

The method of investigation which I have adopted, is to observe on daily synoptic charts the relative changes of the isothermal, with the isobaric lines, care being taken to allow for the effects of varying radiation.

As to the position and shape of this heat area, Figs. I. and II. may be considered typical of the most common type of British weather; where it will be seen that there is a projection of the isothermal upwards, towards, but not up to, the centre of the cyclone, at right angles, or a little in front of right angles, to the direction of its motion, in the centre of which there is usually found an isolated patch of higher temperature. As the cyclone advances, the heat area maintains the same relative position to its centre. This patch is generally near, or a little in front of, the steepest isobarics, and of the most rainy portion of a cyclone. Another very typical case may be illustrated by the following example. On August 31st, 1872, the fragment of a shallow depression lay to the NW of Stornoway, and the isotherm of 60° crossed England from Bristol to Scarboro'. Next morning the position of the centre was just south of Stornoway, but the cyclone had become much deeper, and the isobarics much tighter, while the isothermal of 60° had reached up to Nairn, with a patch of 69° over England. The third morning, the storm was disappearing in almost the same position as on the 31st, and the isothermal of 60° had retreated to a line drawn from Pembroke to Scarboro'.

In these cases of rebuffed cyclones the heat area, as well as the steepest isobars, are more nearly in front of the cyclone path.

To interpret this disposition of the isothermals, it must be borne in mind that there is always an isothermal slope from the Equator northwards, whence it would appear that the heat due to the cyclone is really an almost isolated patch, which gives the isothermal lines a projection upwards.

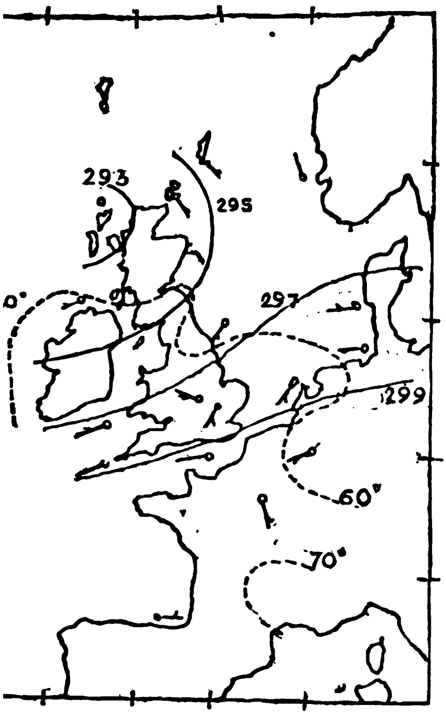


FIG 1.

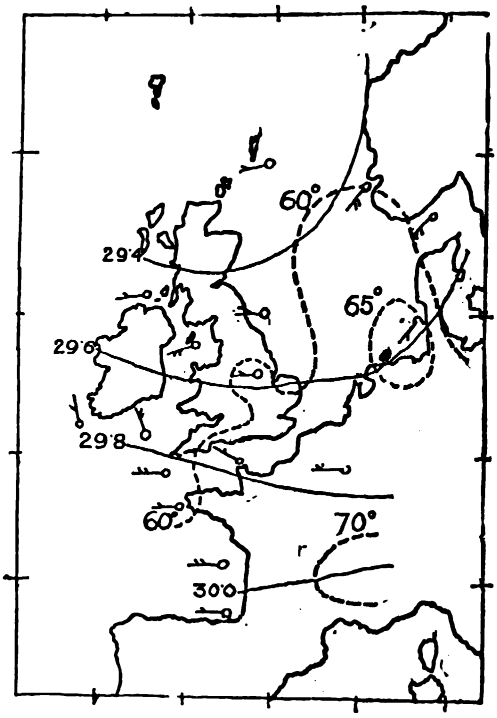


FIG. 2.

The amount of heat developed is difficult to measure, on account of the variable amount of radiation. It is greater in front of large and deep depressions than in front of smaller ones, and greater in storms going N than in those going E. Perhaps about 5° would be an ordinary amount.

The character and quality of this heat differ greatly from that due to radiation. Extreme damp, mugginess, and a peculiar feeling of oppression, are the leading features. Rheumatic pains in men, the uneasy movements of animals, insects, leeches, the foul smelling of ditches, &c., which according to many popular prognostics presage rain, I have observed to be always associated with the heat in this part of a cyclone.

As to the sources of this heat and damp, it is evident that since their position relative to the cyclone centre is always the same, they must be due to some phenomenon of cyclonic motion, and their isolated position shows that they are not merely due to the setting in of a southerly wind.

In a swirl of leaves, (Fig. 3), it may be observed, that they are most closely packed together on a portion of one side, where the motion of rotation and translation coincide.

DIAGRAM SHOWING THE COMPRESSION IN A LEAF SWIRL.

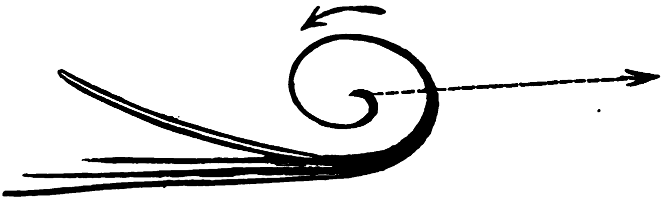


FIG. 3.

In a land water-spout, the ring of water, or more properly cloud, is identical in position with the ring of compressed dust in a dust-storm, and both these phenomena prove the possible co-existence of vertical rotation with local compression.

There seems, then, the strongest presumptive evidence, that the heat and damp which accompany one portion of a cyclone are due to a compression in that portion.

By observing whether the physiological action of the heat of artificially compressed air is the same on a leech as that which accompanies cyclones, it would probably be possible to put this idea to a crucial test; and I regret that I have not the appliances at my command to do so.

As to the greater warmth with S winds than appears simply due to blowing from a generally warmer area, it may be remarked that every S wind has a loss of motion eastwards, due to the earth's rotation, to be accounted for, which is possibly the source of the heat.

Behind the centre of a cyclone is an area, less defined than the heat area, but possessed of opposite qualities, viz. cold, dryness, and an exhilarating influence on men and animals. By the analogy of a leaf swirl, this is probably due to rarefaction, for there we see an ill-defined area, behind the centre, containing fewer leaves than other parts.*

* Since writing the above, I wish to add the following observations on some remarks that have been made on my suggestion as to the principal source of cyclone heat.

That this heat is not due to the latent heat of condensation, seems proved from the fact that its amount is not proportional to the rainfall, but to the steepness of the gradients; also that heavy rain often falls after the barometer has begun to rise, and the air to become cooler.

Cyclone compression would not be shown by the barometer. If a flat-bottomed cup of tea is rapidly stirred, the light leaves will form a compressed ring, a short distance from the centre, though the pressure on the bottom of the cup must be lessened, from the diminished depth of fluid over it, due to the hollowing of the vortex. This is one of the paradoxes of vortex motion which has not received a mechanical explanation.—*January* 1875. R. A.

DISCUSSION.

Captain Toynbee thought that the author had not sufficiently considered the amount of heat which was disengaged through the condensation of moisture in the air, which condensation was generally most abundant in the front of the cyclonic areas which pass over this country.

Mr. Gaster objected to the phenomena observed being explained by the mere words "condensation" and "rarefaction." He wished to know to what those terms applied, to the air or vapour? For his own part, he thought it must be proved that there *is* such "condensation" of air in the front of a depression, *i.e.* in the locality of the high temperature referred to, and "rarefaction" in its rear, before the explanation can be examined into.

Mr. Strachan said he did not think the south winds are always attended with heat,—at least it is not always the case in May.

Mr. Scott said that there was a difficulty in *proving* the existence of the compression or the rarefaction spoken of by the author. It appeared to him that the barometric readings alone could exhibit them; but although it was a known fact that the approach of many serious storms accompanied by rapid barometrical falls were immediately preceded by a sudden rise of the barometer, it had not yet been shown that the barometrical readings immediately after the passage of a cyclonic area indicated a less amount of pressure than had prevailed before the approach of the disturbance. It appeared to him that the rarefaction, if it really existed, must produce such an effect.

Mr. Laughton had lately seen some observations which had been sent home from the 'Challenger,' amongst which were some notices of heavy gales at Kerguelen. These gales were preceded by an unusually high barometer, which fell rapidly as the storm began from the north; as the wind shifted to the west the barometer rose. It was quite evident that they were cyclonic storms passing towards the south-east. With respect to the rainfall in the leading side of cyclones, and the theory which explained the onward march of cyclones by reference to this rainfall, he was anxious to learn whether it applied to tropical cyclones: he could understand that the equatorial wind on the east side of storms in the temperate zones might give rise to a greater precipitation, and so, by aspiration, cause the storm to move towards the east; but he did not see how the polar wind, on the west side of tropical cyclones, could produce the same effect.

Mr. Strachan said that in one of the storms which Loomis had worked out, he had shown that rain was falling all over the United States at the same moment. The latent heat set free in such enormous condensation of vapour must have some effect on the temperature of the air. If this was exhibited in the front of the storms of the temperate zone, it was not the case with the tropical ones, as Mr. Laughton had stated. For his part, he inclined to the theory that cyclones originated from extensive precipitations forming atmospheric eddies, which are carried forward in the general direction of the atmospheric movement; westward in the tropics, eastward in the temperate zone, working about a district of high pressure.

XXVIII. *Atmospheric Pressure and Rainfall.* By John C. Bloxam, F.M.S. (Abstract.)

[Received July 22nd. Read December 16th, 1874.]

The following statement is founded on Mr. Scott's Daily Weather Reports, commencing with April 1872, and ending with March 1873. The form of question and answer is adopted for the sake of brevity.

A. What are the relative quantities of Rainfall, as connected with *high pressure* and *low pressure* respectively?

Looking to the results for the twelvemonth, the rainfall connected with high

pressure is less than that connected with low pressure. Looking to the results for the respective months, the rain for each month is, with one exception, less than the mean for the month, on the days of high pressure, and it is invariably above the mean on the days of low pressure. The rain that fell on the day after the observation for pressure should be compared with that which fell on the day before the observation. Low pressure is accompanied with the greater rainfall on the past day, and high pressure is accompanied with the greater rainfall on the following day. In nine out of the twelve months, low pressure is accompanied with the greater rainfall on the past day. In eight months, high pressure is accompanied with the greater rainfall on the following day.

B. What are the relative quantities of Rainfall, as connected with *increase* and *decrease* of pressure?

Small increase of pressure is accompanied with much less rainfall than large increase is: the quantity of rain is the same on the day past as on the day following. Small decrease of pressure is accompanied with less rainfall than great decrease is. The day past gives less rain than the day following, when the decrease of pressure is small; and the day following gives less rain than the day past when the decrease of pressure is great.

C. Looking to the *balance* between increase and decrease of pressure for the day over the *whole area* of observation, what is the correlative rainfall?

The balance is indicated by the percentage value for decrease. Such high percentage values are accompanied with considerably more rainfall than the low values. The rain is the same on the day past as on the day following with the low values, and it is ·01 in. greater on the day following than on the day past with the high values.

D. Looking to the balance between *increasing* and *decreasing* pressure at the time of observation over the whole area, what is the correlative rainfall?

This balance is indicated by the percentage of risings—balancing the number of rises with the number of falls. The low percentage values are accompanied with more rain than the high values. The rain is ·009 in. more on the day following than on the day past with low values, and it is ·004 in. more on the day following than on the day past with high values.

E. When the percentage values for "—," as given in the Weather Reports, are above 50 for *two or more days* in succession, what is the result as to rainfall?

The values being above 50 for two days, the rainfall on the second, or past day is ·16 in.; the average daily fall for the year being ·109 in.; and the fall for the third, or following day, is ·12 in. When the pressure has been thus low for three days, the rainfall on the third day is ·15 in., and on the fourth, ·10 in. When for four days, the rainfall is ·17 in. and ·15 in. When for five days, the rainfall is ·15 in. and ·11 in. When for eight days, ·28 in. and ·15 in. In each of these groups the rainfall is greater on the past than on the following day.

F. When the percentage values "R" (for rising as given in the Weather Reports) are below 50 for *two or more days*, what is the result as to rainfall?

These low values having continued for two days, the rainfall is ·17 in. and ·12 in. For three days it is ·15 in. and ·12 in. For four days, ·16 in. and ·17 in. For five days, ·15 in. and ·09 in. For eight days, ·28 in. and ·15 in. Each of these groups, with one exception, gives a higher value for the day past than for the day following.

G. The *percentage* values for — being *very high*, what, then, is the rainfall at the stations reporting diminished pressure, and what the rainfall for all stations ?

Including all values above 59 and giving the mean values for the year, the rainfall at the particular stations for the day past is ·133 in., and for the day following ·135 in. That for all the stations is ·131 in. for the day past, and ·133 in. for the day following. The mean percentage value here is 93.

H. What *proportion* does the rainfall bear to the diminution of pressure ?

The following Table affords the answer. Looking at the first line of figures,—pressure having diminished ·24 in. in the course of the day, this was preceded by a rainfall of ·134 in. and succeeded by a rainfall of ·141 in.; ·007 being the difference.

—	Past.	Foll.	Diff.
in.	in.	in.	in.
·24	·134	·141	+·007
·34	·192	·154	—·038
·44	·209	·172	—·037
·55	·324	·160	—·164
·64	·328	·179	—·149
·74	·301	·170	—·131
·85	·443	·230	—·213
·95	·397	·128	—·269
1·05	·385	·132	—·253

DISCUSSION.

Mr. Tylor said he should like to offer some evidence to prove that the barometer cannot be considered a correct instrument for registering the absolute weight of the atmosphere, although it often indicates the relative weight correctly. The absolute pressure on the cistern of the barometer varies much more for horizontal motion of the air than it can for mere change of weight of the atmosphere. By analogical reasoning from his experiments on the Injector, described page 215, Phil. Mag. September 1874, he stated that the column of mercury in the barometer shortens for motion instead of lengthening for weight. There is a constant fall in the barometer during the formation of clouds and condensation of vapour into rain in temperate climates, where the rain-making process occurs in the lower strata of the atmosphere. The mixture of dry air and vapour at 40° would cause a change only of 8 parts in a thousand in volume, and yet would cause a considerable lateral and vertical displacement and movement in the atmosphere. The change in absolute weight of the atmosphere under these circumstances would be comparatively slight, and would not account for a fall in the barometer of 0·3 in. or 0·4 in., or 3 per cent. (or 30 parts in a thousand), which is frequent in England during the process of rain-making. Then, directly the rain has fallen and the air becomes quiescent, the barometer rises again, the influence of motion having ceased equilibrium is nearly restored. In tropical countries, where rain is formed at a high elevation above the ground, the horizontal movements in the upper strata are masked completely by the

actual rainfall near the surface, tropical rain making in its fall vertical currents in the direction of the ground, thus causing the barometer to rise because it actually puts an extra line of pressure on the cistern. In the Doldrums, it is well known that the winds meeting near the sea-level constantly mix and cause an upward current, accompanied by condensation of vapour. The barometer is therefore always a little under 30 inches, not because the atmosphere is lighter there than elsewhere, but because there is horizontal motion across the column caused by the generation of rain, and motion upwards caused by the expansion of the air vertically. The two different causes produce the same effect in diminishing the actual pressure on the cistern of the barometer. It is possible with a velocity of 10 miles an hour, in an artificial current of air or blast in a fan to depress the barometer 0·1 inch, independently of any rarefaction or condensation of the air itself. This would cause a fall of 0·5 in. for a current of 50 miles an hour if the barometer fell in like proportion. This rate would accord with that observed in atmospheric storms when the force of the wind is 50 miles per hour. He thought no change of mere weight of atmosphere could cause the barometer to fall 1·693 in. as happened in Guadaloupe in September 1853; or at Bromley 1·0 in. on November 29th, 1874; or 1·21 in. at Guildford at the same time. This result or fall, showing great diminution of pressure, was perhaps equally due to sudden condensation of vapour causing local currents, and to the strong winds derived from distant regions causing horizontal motion across the column of air, and reducing pressure on the cistern of the barometer and causing the column to shorten. Then, on the contrary, in London, on December 1st to 14th, 1873 the barometer averaged 30·5 inches, the atmosphere being excessively still, and fog continuous. Directly rain occurred, on the 15th, the barometer fell for motion in the air. In his experiments on the Injector, described page 215, Phil. Mag. 1874, he found that in the body of the Injector there was 121 lbs. of pressure by the gauge, accompanied by rapid motion of the steam, yet, in an adjoining tube, connected with the water tank opening at a right angle into the Injector, there were two inches of vacuum according to a water gauge. The experiment shows that within an inch of distance of a current of steam at 101 lbs. pressure by the gauge, there was actually an open water pipe with a partial vacuum and a slow motion. This shows how much fluid motion in one direction can influence pressure and motion in another. In the case of the Injector, the friction of the steam against the metal raised the temperature 0°·17, and the pressure 1 lb. above the pressure in the boiler, and yet made a partial vacuum in an adjoining stratum of fluid, that is in the water pipe. This experiment is a proof that the barometer cannot give a true indication of weight when there is motion in the atmosphere. The Injector is a case strictly in point; the currents of steam and water not being separated by any valves, and relieved of the contrary currents occupying adjoining strata in the atmosphere.

Mr. SCOTT stated, that in the October Number of the 'Zeitschrift der Oesterreichischen Meteorologischen Gesellschaft,' Dr. Hann had given an important Paper on the effect of Rainfall on the Barometer; and among other points, he had shown that the heaviest tropical falls were without influence on the daily range of the barometer.

Mr. BINNIE said he could bear out Mr. Scott, for during his residence in India he had not observed any movement of the barometer with rain when unaccompanied by wind.

The PRESIDENT said that, from his own observation, he could confirm the remark just made that heavy rain did not materially affect the diurnal fluctuations of the barometer in approximately tropical countries.

Mr. LECKY said that on the W coast of Ireland the temperature is generally high, the air saturated with moisture, and the barometer the same as elsewhere; why it is so is, that the stratum of damp air is of a very small depth.

XXIX. *Results of Meteorological Observations made at, and near, St. Paul's Island, in the South Indian Ocean.* Drawn up from information received at the Meteorological Office,* by R. H. Scott, M.A., F.R.S.

[Received November 17th. Read December 16th, 1874.]

At the request of Captain Mouchez, of the French Navy, who was charged with the French expedition to St. Paul's Island, for the purpose of observing the Transit of Venus, the Meteorological Committee sanctioned the working up of the observations in their possession, made in the month of December at, and in the vicinity of, that island. The area selected for the grouping of the observations extends from latitude 35° to 40° S, and from longitude 75° to 80° E. H.M.S. 'Megæra' having been beached and subsequently wrecked upon the island in 1871, her log-book has been consulted for information respecting the weather there. A register kept by Captain, now Vice-Admiral, Sir H. M. Denham, of H.M.S. 'Herald,' while surveying the island in 1853, contains observations immediately available, and these have been added. The data for this region contained in the "Reise der Oesterreichischen Fregatte 'Novara,'" only requiring to be converted into English measures, have also been included, and will serve for comparison with the English data. As soon as these results were deduced, they were at once forwarded to Captain Mouchez, who received them before he left on his mission to the island. With a view of rendering them available for meteorological and physical purposes generally, they are now submitted to the Meteorological Society.

The scale errors of the barometer, and of the thermometers, used on board the 'Herald' are not known ; however, these instruments appear to have been fairly accurate. All the other observations have been corrected for instrumental errors, including those from the 'Novara,' which vessel had Kew verified instruments. The wind directions have been corrected for variation of the compass, as have also the directions of the swells of the sea. The data taken from the log of the 'Megæra,' and from the logs of the twenty-nine merchant ships consulted for December, have been selected for the hours 4, 8, noon, 4, 8, midnight; but failing these, for such hours as gave the best mean daily values. The following results for December are deduced from the symmetrical observations :—

Hours.	Mean Pressure.	Mean Temperature.	Sum of wind components.	
			N	W
	In.	°		
4	30·008	59·2	30·8	24·0
8	30·013	59·7	34·1	24·7
Noon	29·997	60·8	40·5	20·2
4	29·968	61·5	40·8	34·8
8	29·975	61·3	39·6	37·3
Midnight	29·959	61·0	50·3	38·2
No. of days.	18	16	18	

* This paper has been prepared by Mr. R. Strachan, F.M.S.

Results of Meteorological Observatio

Authority.	Month.	Hours or Days of Observing.	Barometer at 32° Fah. & sea level.		Temperature averages.					
			Average.	No. of Obs.	Air.	No. of Obs.	Evap.	No. of Obs.	Sea.	N (
			In.		°				°	
H.M.S. *Herald* surveying in 1853.	January.	Noon	30·036	11	63·2	11	—	—	59·6	
	,,	6 p.m.	30·026	12	61·9	12	—	—	58·7	
	,,	Midnight	30·028	10	61·4	10	—	—	57·8	
H.M.S. *Megæra* on St. Paul's Island, 1871.	June	15 days	29·945	68	—	—	—	—	—	
	July	31 ,,	29·928	29	51·3	31	In	Tent	—	
	August	31 ,,	30·057	30	55·3	17			—	
	September	5 ,,	—	—	—	—	—	—	—	
Austrian frigate *Novara*, 1857.	November	13 ,,	30·024	182	55·7	182	54·5	182	55·2	1
	December	9 ,,	30·207	126	57·7	126	54·7	126	57·0	1
29 Ships, 1855-72	,,	42 ,,	30·021	210	61·0	185	58·9	179	59·8	[illegible]

Observations of Wind, referred to Sixteen Poi

Authority.	Month.	Hours of Obs.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.		
			o*	F.	o.	F.	o.	F.	o.	F.	o.	F.	o.	F.	o.	F.	o.	F.	o.
HMS. *Herald* surveying in 1853.	Jan.	Noon	1	6·0	—	—	—	—	—	—	—	—	—	—	—	—	2	1·0	—
	,,	6 p.m.	1	4·0	—	—	—	—	—	—	—	—	—	—	1	2·0	—	—	1
	,,	Midn.	2	4·0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
HMS. *Megæra* on St. Paul's Island in 1871.	June	4 hourly	2	7·0	2	6·0	—	—	—	—	—	—	—	—	—	—	—	—	—
	July	,,	16	4·2	—	—	—	—	—	—	—	—	—	—	—	—	11	5·0	7
	Aug.	,,	14	2·6	1	2·0	1	4·0	1	2·0	—	—	2	4·0	3	4·0	1	2·0	23
	Sept.	,,	3	5·3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Austrian frigate *Novara*, 1857.	Nov.	14 hours	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Dec.	,,	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29 Ships, 1855-1872.	,,	(mstly 4 hly.)	28	4·4	4	4·5	14	4·4	4	4·3	—	—	2	3·5	10	3·7	5	4·0	[illegible]

* o signifies number of observations; F, mean force by Beaufort scale.
† Rain generally falls as drizzle; dew was frequently noted, but has not been tabulated here.

Latitude 35° to 40° S, Longitude 75° to 80° E.

Sp. g. of Sea at temp. 60°.		Notations of Weather.									Character of Clouds.									
Average.	No. of Obs	No. of Obs.	b.	c.	o.	m.	f.	r. h.	q.	l.	No. of Obs.	Amount.	No. of Obs.	Cir.	Cir-c.	Cir-s.	Cum.	Cum-s.	Str.	
—	—	11	4	6	1	1	—	1	4	—	—	—	—	—	—	—	—	—	—	—
—	—	12	4	7	1	—	—	2	4	—	—	—	—	—	—	—	—	—	—	—
—	—	10	3	5	2	2	—	2	4	—	—	—	—	—	—	—	—	—	—	—
—	—	90	10	56	24	2	—	55	57	—	Rain mostly in drizzle or passing showers.									
—	—	186	14	121	51	1	—	128	68	—	Rain mostly passing showers; snow twice; h frequent.									
—	—	186	30	139	17	2	—	91	27	—	Frequent passing showers.									
—	—	30	6	18	6	—	—	9	12	—	Hurricane 2nd and 3rd, very destructive.									
1·0257	7	—	—	—	—	—	—	—	—	—	182	8·0	—	—	—	—	—	—	—	—
1·0260	5	—	—	—	—	—	—	—	—	—	126	6·6	—	—	—	—	—	—	—	—
1·0267	25	209	48	76	85	33	21	19†	11	3	209	6·9	159	5	26	21	67	8	11	2

with mean force (by Scale 0 to 12); direction true.

SSW.		SW.		WSW.		W.		WNW.		NW.		NNW.		V'ble.		No. of Calms.	Total Obs.	Resultant.		Swells of the Se
O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.			Dirch.	Force.	Direction from, days.
2	4·0	—	—	—	—	—	—	—	—	5	3·4	1	5·0	—	—	—	11	NW.	1·9	—
2	4·0	—	—	1	5·0	—	—	1	5·0	4	2·3	1	6·0	—	—	—	12	N 78° W.	1·7	—
2	2·0	—	—	1	5·0	—	—	1	5·0	3	3·7	—	—	—	—	—	10	N 64° W.	2·0	—
3	6·3	2	8·5	7	5·6	4	6·2	7	4·1	6	7·0	35	5·7	20	2·6	2	90	NW.	4·0	—
31	4·6	9	3·5	22	4·0	2	2·5	28	3·9	11	3·6	33	3·4	14	2·0	2	186	W.	1·8	Heavy surf bar, 2.
37	3·0	15	3·1	17	3·0	6	3·2	18	3·3	8	5·0	26	3·3	10	2·4	3	186	S 77° W.	1·3	Heavy surf, 2; r lers from E, 2
3	7·0	—	—	1	11·0	—	—	11	5·4	3	2·7	7	2·1	—	—	—	30	N 69° W.	3·0	Heavy rollers fr E, 1, heavy su 2.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	182	N 69° W.	1·7	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	126	N 35° W.	1·7	—
3	4·0	5	5·2	13	5·0	27	5·0	24	5·0	37	5·0	46	4·5	—	—	1	225	N 43° W.	2·8	SW, 3; SSW, WSW, 2; WN 2; ESE, 1; E, ENE, 2; NE, NNE, 2; smooth, 15.

A severe hurricane was experienced at the island in September, 1871. The 'Megæra's' log notes as follows :—

September 2nd, 4 a.m.,	WNW	4	
8 ,,	,,	6	
noon	,,	9	
4 p.m.	,,	9	
8 ,,	,,	9	Surf setting in.
midn.	SSW	9	Very heavy rollers from E.
September 3rd, 4 a.m.	WSW	11	Tremendous surf on bar.
8 ,,	SSW	10	Occasional violent squalls from SE.
noon	WNW	7	From midnight to 2 a.m., boats blown
4 p.m.	,,	4	adrift; the 'Megæra' broke up. Large
8 ,,	NW	8	pieces of the wreck and boulders weighing
midn.	,,	2	half a ton were washed twenty feet beyond

high-water mark. Much damage was done to tents, houses, boats, &c. At 9 a.m. from 2000 to 3000 tons of cliff fell. The surf continued heavy during the day, but the wind abated after noon.

From an account of the island by Captain Denham, in the 'Nautical Magazine' for 1854, the following notes have been extracted :—

"The north winds here bring murky weather, with a saturating atmosphere. The W and SW winds are crisp and invigorating. The barometer during our stay ranged between 29·98 in. and 30·26 in., and the temperature between 59°·6 and 64°·8." . . . "November to March forms the summer season; June to September are the coldest, and in every respect the winter, months; and it is in the winter season only that thunder and lightning occur, and then so rarely as to happen but once in the season." . . . "Not a tree or a shrub grows on the island, on account of the severe gales of wind to which it is subject."

DISCUSSION.

Mr. SYMONS said that observations from these isolated stations were very useful. It might be well to mention that he had just sent out a complete set of instruments to the Falkland Islands, where he had secured a good observer, and he believed the observations would be very valuable.

Mr. LAUGHTON said that valuable as observations from the Falkland Islands would be, as tending to elucidate the meteorology of that neighbourhood, he thought that the observations from St. Paul's were still more interesting; in fact, they had a very exceptional interest, from the position of the island in the doubtful region between the trades and west winds. He hoped that in course of time more complete observations might be obtained both from St. Paul's and from Tristan d'Acunha, which occupied a corresponding position in the Atlantic.

THE PRESIDENT said that records of observations in distant and out of the way parts were often unexpectedly valuable. As an instance, he would mention that Alexandria had originally been selected as one of the principal stations for observing the transit of Venus, but afterwards it was given up, under the advice of men experienced in Egyptian meteorology, in favour of Cairo and Thebes, on account of the superior chances of clear skies at those stations; and the actual results had justified the wisdom of this change, made under a meteorological forecast, in a very remarkable way.

Mr. SCOTT said he was very glad to hear that Mr. Symons had succeeded in getting a set of instruments sent out to the Falkland Islands. The Governor

had recently sent a requisition for an anemometer to be sent out, but he (Mr. Scott) would not send one out till the observers there could read their barometers and thermometers correctly first. The Meteorological Office had had a set of instruments at the lighthouse at Cape Pembroke for 16 years, but the records were not very satisfactory, and he (Mr. Scott) had never been able to succeed in having the station inspected.

XXX. *Description of a New Patent Portable Magnetic Anemometer and Current Meter for Maritime use.* By R. M. Lowne.

[Received December 1st. Read December 16th, 1874.]

The instrument which is here described, and at the same time presented to the notice of the Meteorological Society, has been in some measure suggested to the constructor by a resolution of the recent Conference on Maritime Meteorology, held at the Meteorological Office in London, which recommended that "various forms of anemometers should be specially tested by ships" at sea, with a view to prove whether reliable results can be obtained from the use of anemometers at sea; and by a desire expressed by Herr H. A. Meyer, of Kiel, the Commissioner for investigating the German seas, to have some portable and convenient form of instrument contrived, which might be made available for examining ocean currents.

The particular instrument submitted on this occasion to the Society, has been completed to be placed in Captain Toynbee's hands, in order that it may have its efficiency and usefulness brought to a practical test at sea in accordance with the suggestion of the Maritime Conference, by one of the experienced captains of the Cunard line of steam vessels.

The measurement of the current, whether of air or water, is primarily effected in this instrument, as in a form of anemometer originally constructed for Mr. Casella by the patentee, by the revolution of a wheel carrying a number of plates of very thin aluminium, so arranged that their flat surfaces lie at an angle of 45° to the plane of the wheel's motion. When a wheel so formed is placed in a current, whether of air or water, it revolves in a given time a number of turns that exactly express the velocity of the current which passes the wheel. The number of the revolutions of the wheel is indicated by pointers turning on a dial, and traversing circles on which the lineal feet of the current are expressed by graduations and figures. The fan-wheel is contained within a metal tube open at both ends, and is so placed that its own axis corresponds with the axis of the tube. The pivots of the axis of the fan are of conical shape, and run in sapphire centres; by this method of construction, considerable strength is secured, at the same time that the friction is reduced to a very trifling amount. The entire instrument is made of considerably greater strength than the forms of anemometer previously constructed by the patentee. And it should be further observed that this strength can be very readily augmented yet more in the case of an instrument employed for investigating deep-sea currents.

But the great feature of novelty in this instrument is the method by which the motion of the fan-wheel is communicated to the indicating apparatus. In order that the instrument may be available for use when immersed in water, or in a continuously moist atmosphere, it was indispensable that the mechanism of the indicator should be hermetically sealed up from all contact with the medium in which it is immersed, at the same time that the intimate communication between the revolving fan and the recording mechanism was as intimately preserved. This seemingly impracticable condition has been very effectively, and quite satisfactorily, accomplished by the employment of magnetism. There are in the anemometer two distinct axes ranging in the same line, and separated at one point by an intervening diaphragm of metal, which forms part of the sealed case of the indicator. One of these axes carries the fan-wheel, and a bar magnet revolving at right angles to its axle, with the fan. The second axis carries, in close correspondence with the magnet, and only separated from it by the intervening diaphragm of thin metal, a piece of fine soft iron wire, and then the first moving parts of the train of the indicator. The bar of soft iron becomes a magnet by induction, and is so constrained to revolve with the magnet that is carried, on the other side of the diaphragm, with the fan. The delicate mechanism of the indicator is, by this arrangement, kept water and dust tight. The working parts which are exposed to the current, namely the fan-wheel, axes, and magnet, are all, with the exception of the aluminium, very carefully tinned after they are put together, so as to present an outer surface of tin only, which is also protected by lacquer in the usual way.

The instrument indicates low velocities with great accuracy on account of the extreme lightness of the works, whilst it records very high velocities without any danger of damage, or breaking, for the same reason; the fans, being so very light, move with the current almost without resistance. With very high velocities, however, the magnet over-runs the soft iron bar driving the indicating parts. It was found, by careful experiment, that this result occurs when the fan-magnet revolves 8000 times in a minute. The friction, at this velocity, is greater than the attraction of the magnet and soft iron bar.

This difficulty has been entirely met by the provision of a slip of metal so planned that it cuts off just enough of the fan-plates to reduce the velocity of the fan-wheel one half. 8000 revolutions of the fan-wheel and magnet are then only obtained by currents moving with a velocity of 90 miles an hour, a speed which it is presumed is fairly in excess of any that can have to be measured.

One practical objection that presented itself to this form of instrument when it was first planned, was the danger of the small magnets losing too soon their magnetic power. After much thought and experiment, this objection has been entirely obviated by the very simple expedient of having a powerful permanent magnet, so arranged in the case of the instrument, as that its poles act inductively upon the small magnet whenever it is placed away in the case, and so maintain the magnetism of the small fan-wheel magnet permanently.

The large magnet has soft iron projecting at right angles into the case in such a manner that these soft iron poles lie close to the poles of the fan-magnet when within the case. The large magnet has an armature of soft iron fixed across its steel poles, so that the full force of the large magnet is only brought to bear upon the small fan-magnet when this armature is temporarily removed.

Gymbals, and a directing vane, have been prepared to carry the anemometer when in use at sea. But the instrument may be more conveniently held in the hand, and directed by it to the wind, for brief intermitting observations of velocity and force. Either one minute, or two minutes, may be conveniently taken for the period of record ; and a stop enables the recording train to be instantaneously started, and stopped. It will be observed that this stop is so applied as simply to disconnect the recording train from the fan, which continues its revolution. In this way, all shock from sudden stoppage of the fan-wheel, or inaccuracy from continued impulse, is avoided.

When the instrument is to be used as a current meter it is attached to a hollow cylindrical vessel with conical ends, in such a way that the fan-wheel alone is exposed to the current, the indicating part being received into the ends of the cylindrical vessel. The cylindrical vessel is attached by a cord fixed to a swivel at one end, and in such a way that the length of the cylindrical vessel secures its direction and keeps the fan-wheel facing the current. The current meter is maintained in a perpendicular position by the cylindrical vessel being partially filled with air. This makes the cone-ended cylinder float horizontally end on to the stream. The whole apparatus sinks into the water to a depth which is regulated by the amount of cord paid out, and by the velocity of the current.

The indications of the indicating mechanism are carefully tested by experiment so far as air currents are concerned, and a table of corrections to be applied for different velocities has also been experimentally and very carefully prepared. A similar experimental determination of corrections for water currents at different velocities is also required ; but opportunity has not yet served to enable the constructor to work this out, as he intends to do. It is a curious fact in regard to the corrections for air currents, that they come out the same whether the stop is used for high velocities, or dispensed with for low velocities. A convenient table is supplied with the instrument to enable revolutions per minute to be at once transformed into velocities in miles per hour. A similar table is also in preparation to give the velocities in kilometers per hour.

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

NOVEMBER 18th, 1874.

Ordinary Meeting.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

ISAAC ASHE, M.D., Londonderry District Asylum, Londonderry;
EGERTON HUBBARD, M.P., 24 Prince's Gate, S W.;
GEORGE WAREING ORMEROD, M.A., F.G.S., Brookbank, Teignmouth;
HENRY PEARDE, M.D., 39 Osnaburgh Street, N.W.;
HENRY C. RUSSELL, B.A., F.R.A.S., Government Astronomer for New South Wales, Observatory, Sydney; and
F. SHAW, 2 Swiss Villas, Scarborough,
were balloted for and duly elected Fellows of the Society.

The names of two candidates for admission into the Society were read.

Mr. E. G. ALDRIDGE and Mr. J. S. HARDING were appointed Auditors of the Treasurer's Account.

The PRESIDENT read a "Report concerning the Meeting of the Conference on Maritime Meteorology in London, August 31st, 1874." (p. 256.)

At the request of the President, Mr. SCOTT gave a brief account of the recent Meeting of the Permanent Committee of the Vienna Congress at Utrecht.

The following papers were then read:—

"On the Weather of Thirteen Springs." By R. STRACHAN, F.M.S. (p. 259.)

"Table for facilitating the determination of the Dew Point from observations of the Dry and Wet Bulb Thermometers." By WILLIAM MARRIOTT, F.M.S., Assistant Secretary. (p. 271.)

"On the Heat and Damp which accompany Cyclones." By the HON. RALPH ABERCROMBY, F.M.S. (p. 274.)

The Meeting was then adjourned.

DECEMBER 16th, 1874.

Ordinary Meeting.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

WILLIAM CORNWALL PUNNETT, St. Stephen's, Tunbridge, and
REV. GEORGE T. RYVES, The Vicarage, Upper Tean, Stoke-on-Trent,
were balloted for and duly elected Fellows of the Society.

The names of eighteen candidates for admission into the Society were read.

The following papers were then read:—

"Atmospheric Pressure and Rainfall." By JOHN C. BLOXAM, F.M.S. (p. 277.)

"Remarks on West Indian Cyclones." By F. H. JAHNCKE. (Communicated by R. H. SCOTT, F.R.S.)

[Received November 14th, 1874.]

I have drawn a rough sketch of a cyclone with its variable phases, according to the best of my experience. Mr. Meldrum's theory is, also, somewhat represented, as the winds of the central part are connected with ascending currents; but I think this is rather caused by the numerous whirls which are on the

fore side of the central part, for after the calm centre has passed, these whirls disappear, and the wind blows with a steady force, and then diminishes by degrees.

On the south-east side of the cyclone, after it has passed, it is commonly calm, with or without rain; this must be due to the winds being south-west and south, and drawing along with the calm centre. Immediately in the wake of which, or a little more to the north, there is generally a strong SE wind with heavy rain occurring some time after, with thunder and lightning: it appears that the equatorial current, which rushes in to fill up the depression which exists in the wake behind the calm centre, is arrested by the polar current on the north side, and thus causes the heavy discharge of rain.

Amongst the numerous accounts from ships which have come under my notice, I have sometimes found that a captain who takes great interest in the matter has hove to in time to ascertain his position, but even then, I have noticed that he has made a mistake in heaving to on the wrong tack; the variable baffling winds causing this, until the centre has advanced more on the ship, when the wind begins to blow more steadily: then he discovered that he was on the wrong tack, and quickly wears his ship on the other tack.

Another difficulty is to find out what course the storm is taking. In 1872 they were running almost from S to N, sometimes they run to the NW, and at other times from E to W, in the tropical latitudes.

It must, also, be carefully considered what are the qualities of the ship, and whether she is lightly or heavily laden; in such cases the ship's master must use his own judgment as to what is best to be done for the safety of all concerned. A well-conditioned ship with a careful commander can stand a good deal. I have accounts of ships which, under press of sail, have run out of it and over the track before the storm disc advanced on them. It will require careful study to lay down correct rules for ships' masters to avoid these terrible phenomena, as the tracks of the cyclones are so capricious; but as the science has greatly advanced, and barometers are very much improved, the commander of a ship may prepare a great deal beforehand. On the other hand, it is wrong to blame a ship's master for his misfortune, which, with the best intention, he cannot avoid very easily.

The facts are not based upon one season's observations, but on 20 years' experience, ever since Colonel Reid's work first fell into my hands.

Mr. Strachan stated, in the discussion on my former paper (page 95), that my conclusions were unsupported by facts. In reply to this, I may state that I am in possession of such a great pile of the daily records of my own observations, as well as those I have collected in the different reports of cyclones, that I could almost write a book on the subject.

I consider that Kämtz's Meteorology and Professor Dove's work (last edition, 1873) are the best books on this subject; Professor Dove's work I believe to be the most correct, and any one who builds upon it will not easily fall into error. Professor Reye, in his work (1872), in speaking of ascending currents, may allude to tornadoes which have a small diameter; but he would fall into error if he were to apply this theory to cyclones, where Professor Dove's theories are more correct. On page 146 of this work he speaks of all the old authors, and says it would be ungrateful to ignore their views; but none of them have given any satisfactory explanation of their development; they have left that an open question. They do not say what the causes are, they only describe the phenomena. I think it is a pity that Professor Reye's work is not translated into English in an abridged form.

Mr. Strachan said that he had not alleged want of experience on the part of the author, but that his former paper was unsupported by facts, and he was of the same opinion still.

"Notes on the Weather experienced over the British Isles and the North-West of France, during the first few days of October, 1874." By Robert H. Scott, F.R.S.

[Received November 16th, 1874.]

The object of this short communication is to show to the Society the risk which is run when conclusions as to weather are drawn from comparatively in-

sufficient data. In the particular case in question the 'Bulletin International' for October 2nd contained a chart on which was drawn a track for a cyclone which was supposed to have passed northwards from near Ushant to the north of Scotland, and then turned eastwards. The facts on which this track had been drawn were the telegraphic reports furnished to the Paris Observatory by the Meteorological Office, which consisted of reports from only six stations in the United Kingdom; and these telegrams, taken with those from France, had sufficiently indicated the existence near Ushant of an area of depression at 8 a.m. on the 1st of October, and the existence of an area of depression off the north coast of Scotland on the 2nd of October at 8 a.m.

These two depressions had been assumed at Paris to be one and the same, in the absence of sufficient telegraphic information to show that they were really distinct one from the other.

It is self-evident that, as the Meteorological Office itself receives daily reports from 29 stations in the United Kingdom, which admit of drawing charts both for 6 p.m. and 8 a.m., as well as a few reports for 2 p.m., it must necessarily be in possession of more complete information for these Islands than can be obtainable in Paris under present arrangements. The evidence from the British Reports shows that the cyclonic disturbance which lay near Ushant at 8 a.m. on the 1st moved eastwards during the day, and died out before it reached Holland in the course of the night. While this was disappearing, however, a very sudden and rapid fall of the barometer set in at our northern stations, and by 8 a.m. on the 2nd a totally new disturbance had established itself over the Hebrides, which subsequently passed eastwards over the North Sea.

These facts simply show that the authorities in Paris would not have drawn the storm track given on the Bulletin for October 2nd, had they been in possession of sufficiently detailed information to show the real history of the two storms.

At the same time, the occasion seems a fitting one to bring before the Society a suggestion which has been made to me by Major-General R. Strachey, F.R.S., for the general adoption in weather maps of a conical projection instead of Mercator's, in order to obviate the risk of incorrect representation of the shape and dimensions of cyclonic and anti-cyclonic areas, owing to the amount of distortion, especially in high latitudes, rendered necessary by the use of the latter projection. With this object, I shall read to the Society the following letter, which contains an expression of General Strachey's views:—

"Dear Mr. Scott,—Having lately had occasion to examine some of the charts prepared in illustration of meteorological memoirs, as well as those published by our Committee with the daily weather reports, and similar maps drawn up by foreign observers, it has struck me that considerable advantage would be obtained if meteorologists settled some standard system of projection, on which such maps should be commonly drawn. By coming to an understanding on this subject, all meteorological diagrams of the nature referred to would be made immediately comparable, and could be joined one to another if a suitable projection were adopted.

"The inconvenience of Mercator's projection, from the extreme distortion it introduces, and the erroneous directions of the meridians in the higher latitudes, is obvious. I have drawn out a scheme of projection which seems to me likely to be suitable, which I should be glad to submit to criticism, with a view to its adoption, either as it stands, or subject to any modification, for the reasons I have explained.

"As the greater number of scientific meteorologists live in the temperate parts of the northern hemisphere, the portion of the terrestrial surface to be represented will commonly lie between the latitudes of 20° and 70°.

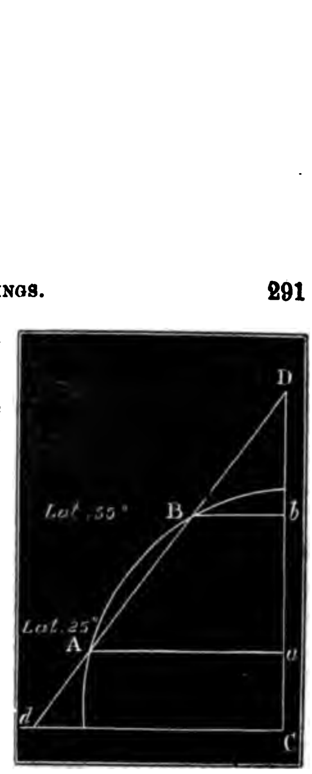
"To arrive at a fairly accurate projection of this region, I would propose to adopt a conical development, the surface of the cone being supposed to cut the sphere on the 25th and 55th circles of latitude. I find that by such a projection the error in the positions of the meridians will be practically inappreciable on any scale likely to be adopted from latitude 20° N to latitude 60° N. Beyond these limits the error is sensible, but nothing at all to compare to that caused by Mercator's system.

"I should also propose to depart from a truly conical projection by making the degrees of the meridian equal, and adopting the length of the meridional *degree at* latitude 45° throughout every meridian.

"The annexed diagram will explain the projections proposed.

"C is the centre of the sphere.

"D B A d, the conical surface cutting the sphere at latitudes 25° and 55°. 1° of the meridian at latitude 45° is about 364,500 feet. 10° on a scale of $\frac{1}{20 \text{ millions}} = 2{\cdot}187$ inches. The radius of the sphere to same scale = 12·531 inches. AB is assumed to be equal to 30 degrees = 6·561 inches, whence it will be found that Aa = 11·356 inches. Bb = 7·187 inches, and BD the distance of the apex of the cone, or the centre of the circles of latitude for the projection from the circle of 55° N is 11·311 inches.



"Further, it will be found that the several lengths of the arcs of longitude at the various circles of latitude are as follows:—

Latitude.	True length arc of 10°.	Length according to Projection arc of 10°.	Error of Projection in arc of 10°.
°	In.	In.	In.
0	2·187	2·589	+·402
10	2·154	2·346	+·192
20	2·055	2·103	+·048
25	1·982	1·982	0
30	1·894	1·861	—·033
40	1·675	1·618	—·057
53	1·406	1·375	—·031
55	1·254	1·254	0
60	1·093	1·133	+·040
70	·748	·890	+·142

"I have assumed one twenty-millionth as the scale, to approach as nearly as possible to the actual scale of the principal maps of the description in question that I have seen, and I believe that it will be found convenient generally.—I am, &c., (Signed) Richard Strachey."

Mr. Strachan said that, so far as he knew, Mercator's projection was the only one that could give the correct path of the storms traced upon it. He would, therefore, like to know how the present conical projection proposed to accomplish the same thing. He could not even understand how the true direction of the wind could be shown on this projection.

The President pointed out that there was still a considerable amount of distortion in the part of maps with this form of projections which are furthest from the apex of the cone. This projection differs from Mercator's in the fact of this distortion being in one direction, instead of in two.

Captain Toynbee said that the proposed chart appeared to him to be the same in principle as the one proposed by Captain Hoffmeyer, only adapted for use in lower latitudes. He said that at present he was not convinced that the advantages of the proposed chart surmounted the disadvantages which would result if we gave up Mercator's Projection, more especially when considering the relative directions of wind, and the tracks of the storms. He would like to see the same data laid down on both projections, by which a fair comparison might be made.

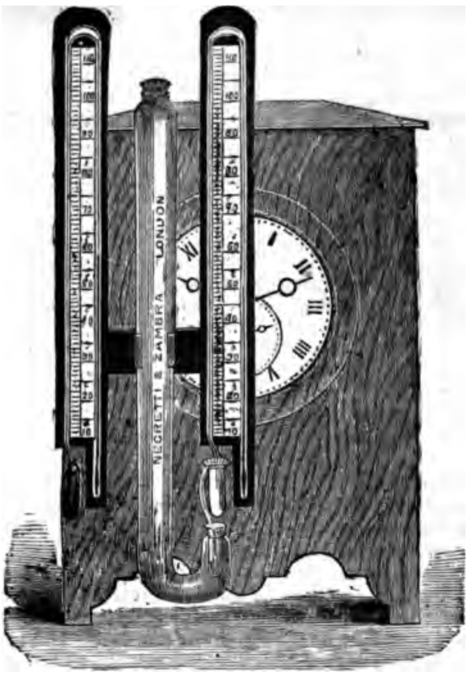
Mr. Laughton thought that the very great distortion of Mercator's projection was more than counterbalanced by the advantage which it had of showing at a glance the direction of the wind and the track of storm, an advantage which no other projection, conical or otherwise, possessed.

"On a New Recording Hygrometer." By H. NEGRETTI, F.M.S., and J. W. ZAMBRA, F.M.S.

[Received November 17th, 1874.]

Having, on May 20th, exhibited to the Society our new form of Recording Thermometer,* it is unnecessary on the present occasion to do more than refer to our previous paper for a description of the thermometers employed, and to state that the New Recording Hygrometer consists of two of these instruments (one with a dry bulb and the other with a moistened one) fixed to a single frame capable of rotation on a horizontal axis.

The hygrometer is attached to an alarm clock, as will be seen in the accompanying woodcut. In this instrument, therefore, observers have the means of taking an absolutely accurate determination of the humidity of the atmosphere at any hour of the day or night which they may desire, thus preventing lacunæ when they are obliged to be absent at fixed observation hours, or enabling them to obtain that great desideratum, hygrometrical records in the early morning hours.



Mr. SYMONS said that Messrs. Negretti and Zambra were hardly doing themselves justice in saying that this instrument only differed from the previous one in that there were two thermometers instead of one: they had now supplied a complete hygrometer, which would be very useful in many ways; for instance, an observer, if he wanted to go out to dinner, need only wind up the clock, and the observations would be taken just the same as if he were at home. Hygrometric observations in the early morning hours were also a great desideratum easily afforded by this instrument.

Mr. BINNIE said he was very glad to see this instrument, and thought it would be very useful. When making some observations on evaporation in India, it was necessary to get the humidity of the air; and if he had had one of these

* 'Quarterly Journal,' Vol. ii. p. 188.

instruments, he should have been able to get an observation at midnight, or any other hour, without the necessity of personal attendance.

Mr. WHIPPLE asked whether, as the water cistern seemed separate from the Hygrometer, the instrument could be used during frost?

Mr. NEGRETTI said that it would act as an ordinary Hygrometer, by having the water cup attached to the instrument and revolving with it; he exhibited one at the British Association at Belfast which had the water receptacle attached to it, so that it turned over with the instrument. (See Woodcut.)

"Results of Meteorological Observations made at, and near, St. Paul's Island, in the South Indian Ocean." By R. H. SCOTT, F.R.S. (p. 281.)

"Description of a New Patent Portable Magnetic Anemometer and Current Meter for Maritime use." By R. M. LOWNE. (p. 285.)

The Meeting was then adjourned.

DONATIONS RECEIVED FROM OCTOBER 1ST TO DECEMBER 31ST, 1874.

Presented by Societies, Institutions, &c.

Calcutta	Meteorological Office	Reports of the Meteorological Reporter to the Government of Bengal, 1867-1873.
	" "	Administration Reports of ditto, 1870-74. By H. Blanford, Meteorological Reporter.
Copenhagen ..	L'Institut Météorologique Danois.	Bulletin Météorologique du Nord, September 1st to November 30th. By Capt. N. Hoffmeyer, Director.
Cracow	K. K. Sternwarte	Meteorologische Beobachtungen, July to October. By Dr. F. Karlinski, Director.
Fiume	I. R. Accademia di Marina	Meteorological Observations, June to September.
Geneva	Société de Géographie ..	Le Globe. Tome xii., livraisons 4-6.
Habana	Colegio de Belen	Observaciones Magneticas y Meteorologicas.
Kew	Observatory	Report of the Kew Committee for the year ending October 31st, 1874. By the Kew Committee.
Klagenfurt	Observatory	Meteorologische Beobachtungen, July to September. By Dr. J. Prettner.
Liverpool	Bidston Observatory	Report of the Astronomer to the Marine Committee and Mersey Docks and Harbour Board, for the year 1872. By J. Hartnup, Astronomer.
London	General Register Office ..	Weekly Returns of Births and Deaths, 1874, Nos. 38-51.
	" " ..	Quarterly Return of Marriages, Births and Deaths, 1874, September 30th. By the Registrar-General.
	Meteorological Office	Daily Weather Reports and Charts.
	" "	Monthly Charts of Meteorological Data for Square 3, extending from the Equator to 10° N lat., and from 20° to 30° W long.
	" "	Remarks to accompany ditto.
	" "	Quarterly Weather Report, 1871, part iv.; 1873, part iii.
	" "	Hourly Readings from the self-recording Instruments at the Seven Observatories in connection with the Meteorological Office, January to May, 1874. By the Meteorological Committee.
	Royal Institution	Proceedings, Nos. 60, 61.
	"	List of Members, Officers and Professors; with the Report of the Visitors, Statement of Accounts, and Lists of Lectures and Donations in 1873.
	Royal Society	Proceedings, Nos. 155-156.
Madras	Government Observatory	Weekly Meteorological Results from the Madras Observatory Register, June 19th to September 25th, 1874. By N. Pogson, Govt. Astronomer.

Manchester ..	Literary and Philosophical Society.	Proceedings, Vol. xiii., No. 12; Vol. xiv. Nos. 1-5.
Melbourne	Observatory	Results of Observations in Meteorology, Terrestrial Magnetism, &c., taken at the Melbourne Observatory during the year 1872; together with abstracts from meteorological observations obtained at various localities in Victoria. Vol. i.
	"	Monthly Record of ditto, April to July, 1874. By R. Ellery, F.R.S., Government Astronomer.
	Royal Society of Victoria	Transactions and Proceedings. Vol. x.
Milan	R. Osservatorio	Osservazioni Meteorologiche, 1873, January to December; 1874, January to August. By G. Capelli, Director.
Modena	R. Osservatorio	La Variazioni del Vento. Lettura del Prof. D. Ragona.
Moncalieri	Osservatorio del R. Collegio Carlo Alberto.	Bulletino Meteorologico, Vol. ix., Nos. 1, 2, January and February, 1874. By Padre F. Denza, Director.
Paris	Observatoire de Montsouris.	Bulletin Mensuel, Nos. 33-35, September to November. By M. Marié Davy, Director.
	Observatoire National ..	Bulletin International. By M. U. J. Le Verrier, Director.
	Société Météorologique de France.	Annuaire — Tableaux météorologiques, 1870, feuilles 7-12.
	" "	Nouvelles météorologiques, 1871, i., 1-4; 1872, i., 1-5; 1873, i, 1-2; ii., 1-6; 1874, i., 1-6.
Philadelphia ..	American Philosophical Society.	Proceedings, No. 92.
Prague	K. K. Sternwarte........	Magnetische und Meteorologische Beobachtungen, 1873. By Dr. C. Hornstein, Director.
Rome	Osservatorio del Collegio Romano.	Bulletino Meteorologico, September and October. By Padre A. Secchi, Director.
Sydney	Government Observatory	Meteorological Observations, April to June, 1874. By H. C. Russell, B.A., Government Astronomer.
Tiflis	Physikalische Observatorium.	Inhaltsverzeichniss zum Bibliotheks Katalog des Tiflisschen Physikalischen Observatoriums nach dem Stand vom 1 Mai 1874. Zusammengestellt von H. Kiefer, Assistant.
	" "	J. B. Biot's Tafeln zur berechnung Barometrischen Höhenmessungen. Neu berechnet und erweitert von H. Kiefer.
Toronto	Education Office........	Journal of Education, September to December. By Rev. E. Ryerson, D.D., Superintendent.
Utrecht	K Nederlandsch Meteorologisch Instituut.	Jaarboek voor 1872. Part ii. By Dr. Buys Ballot, Director.
Vienna	K. K. Centralanstalt für Meteorologie und Erdmagnetismus.	Beobachtungen, August to October.
	" "	Jahrbuch, Band ix., 1872. By Dr. C. Jelinek, Director.
	Oesterreichische Gesellschaft für Meteorologie.	Zeitschrift, Band ix., Nos. 19-23.

Presented by Individuals.

Chase, P. E.	Jupiter-Cyclical Rainfall. By P. E. Chase.
"	Cyclical Rainfall at Barbados. By P. E. Chase.
"	Velocity of Primitive Undulation. By P. E. Chase.
Cleft, H.	Remarks on the Weather of September 1874, at Harbour Grace, Newfoundland (MS.).
Cull, R.	A Volume of MS. Papers (1823-4) belonging to the old Meteorological Society.
Delaney, J.	Meteorological Observations taken at St. John's, Newfoundland, September to November (MS.).
Ferrel, W., M.A.	Relation between the Barometric Gradient and the Velocity of the Wind. By William Ferrel, M.A.
Forbes, A.	Meteorological Summary, Culloden, September and October (MS.).
Freeden, W. von	Circular No. 5 of the German Fishery Society.
Higgs, Rev. W., LL.D.	'The Telegraphic Journal and Electrical Review,' Nos. 40-45.
Hoskins, S. E., M.D., F.R.S.	Meteorological Observations taken at Guernsey, September to November.
Jahncke, F. H.	'St. Thomæ Tidende,' November 21st, 1874.
Lake, W. C., M.D.	Meteorology of Teignmouth, 1854 to 1860. By W. C. Lake, M.D.
Mann, R. J., M.D., F.R.A.S.	Cartes synoptiques journalières, December 1873, construites par N. Hoffmeyer, Directeur de l'Institut Météorologique Danois.
Marriott, W.	Table for facilitating the determination of the Dew Point from observations of the Dry and Wet Bulb Thermometers. By William Marriott.
Miller, S. H., F.R.A.S.	The Fenland Meteorological Circular and Weather Report, October to December.
Pearde, H., M.D.	Meteorological Observations taken on board the 'William Davie' and 'Margaret Galbraith,' from London to the Bluff, and from Otago, New Zealand, to London, 1874. By Henry Pearde, Surgeon-Superintendent, New Zealand Government Emigrant Service (MS.).
Plantamour, Prof. E.	Resumé Météorologique de l'année 1873 pour Genève et le Grand Saint-Bernard, par Prof. E. Plantamour.
Power, R. E., M.D.	Meteorological Observations at Dartmoor, September and October (M.S.).
Silver, S. W.	'The Colonies,' Nos. 170-176.
Symons, G. J.	Symons's Monthly Meteorological Magazine, October to December.
" "	Symons's British Rainfall, 1873.
" "	British Association Reports on Rainfall, 1872, 1873.
" "	Sur le Climat de Belgique, par A. Quetelet. Parts ii. and iii.
Taylor and Francis	Taylor's Calendar of the Meetings of the Scientific Bodies of London for 1874-75.
The Editor	'Nature,' Nos. 257-269.
Travancore, H. H. the Maharajah.	Observations of Magnetic Declination made at Trevandrum and Augustia Malley in the Observatories of H.H. the Maharajah of Travancore, G.C.S.I., in the years 1852 to 1869, being Trevandrum Magnetical Observations, Vol. i. Discussed and edited by John Allan Broun, F.R.S.
Tripe, J. W., M.D.	Report on the Sanitary State of the Hackney District, 1855 to 1873. By J. W. Tripe, M.D., Medical Officer of Health.
Turner, G., M.D.	Report of the Medical Officer of Health of the Borough of Portsmouth to the Urban Sanitary Authority, with Tables of Deaths for the months of May to December, 1873.
Turtle, Lancelot	The Weather at Aghalee during the months September and October.

QUARTERLY JOURNAL

OF

THE METEOROLOGICAL SOCIETY.

Vol. II. No. 14.

An Address delivered by the President, Robert James Mann, M.D., F.R.A.S., *at the Annual General Meeting, January 20th*, 1875.

On the Twenty-fifth Anniversary of the history of the Meteorological Society, it falls to my lot to have once again to address, from the Presidential chair, a few passing words of congratulation, and of hopeful augury. The Report which the Council and Officers have been able to submit at this General Meeting sufficiently indicates the ground upon which the note of congratulation may be raised. But there are some topics comprised within the range of that official statement of affairs, that so immediately concern any "forecast of a high pressure area and fine weather ahead," over and above any weight they possess as a record of present and past proceedings, that I shall hope to have your ready indulgence if I draw some further, and some more special, attention to them upon this occasion.

It can scarcely have escaped the observation of our Fellows that the practical outcome of the recent Conference of Meteorologists at Leipzig, of the Meteorological Congress at Vienna, and of the Maritime Conference in London, is an unmistakeable and most satisfactory movement on the part of the leading authorities of meteorological science towards concerted and uniform action in the prosecution of their favourite pursuit. Meteorologists, in these international gatherings, have unquestionably taken home to themselves the moral of the old world fable, which told how much stronger a bundle of sticks is, than are the individual rods of which it is composed when these are dissevered from their source of mutual connection and support. The proceedings of the Maritime Conference, at which it was my pleasant privilege to assist as your representative, were every where instinct with this spirit and teaching. In the Report of the deliberations of the Conference

which I have had the honour to present to my colleagues of the Council, and which has been printed in the Quarterly Journal, it will be noted that resolution after resolution was framed to insure uniformity of procedure, and to bring about consentaneous action. The two Forms for the authoritative Record of Observations which have been matured by the conjoint action of the Meteorological Office and of our Form Committee for stations of the second and third order, must be accepted as first-fruits of our contributions to this most excellent work; and I think I may safely say that the Society is to be warmly congratulated on the fact that the larger and more important of these Forms has been adopted by the Army Medical Department of our own Government, and that it has also been very favourably looked upon by the Permanent Committee of the Vienna Congress.

But the Meteorological Society has been happily moved this year to initiate something further in the way of practical co-operative work. It has long been obvious that a series of well-considered and equipped, and carefully inspected observatories, assuming the full responsibility of authorised stations, had become matters of prime necessity to the future of our history. After much careful deliberation, and some sustained and anxious labour, a first instalment of these 'authorised observatories' has been organised. It will be of some interest to the Fellows to observe that three of these parent stations of the Society occupy a line along the southern land-range of England, from the bold western outpost of Dartmoor, that faces the inflowing winds of the Atlantic, through the channel counties of Hampshire and Sussex to the eastern outcrop of the land in Kent. The great western inlet of the Bristol channel is secured by a station at Bath, and a corresponding station for the eastern estuary, the Thames, is held in Essex, at Audley End; whilst the central land tract between these estuaries is marked by the observatory at Marlborough. The station near Louth is in the extension of this eastern line of work towards the north. Cheadle and Buxton are admirable central, or midland, stations, the observational pivots of the meteorology of England. The narrow northern track, the neck of the English range of Great Britain, is efficiently occupied at Hestholme, near Bedale, in Yorkshire. A station at Carmarthen, with a subsidiary post at Pwllheli, at the northern extremity of the Bay of Cardigan, are the observational pillars of Wales, that catch the first impact of the air-drifts sweeping over St. George's Channel and the Irish Sea. These stations belonging to the Society are further very happily strengthened by five stations belonging to the Meteorological Office, at which entirely analogous observations will be made. Of these Meteorological Office stations one is in admirable support of our midland stations at Cheadle and Buxton, being situated in Warwickshire; and a second is in support of the Thames Estuary station, being at Chatham. The other three stations occupy the very important outlying districts of the centre and north-west coast of Ireland, and the grand northern outpost at the portals of the Arctic sea, namely at Sumburgh Head, the southern promontory of the Shetlands.

The Fellows will understand that these are all stations of the second order, —that is, stations which do not undertake the work of continuous automatic

record,—but which furnish the larger and more complete record required by the more important of the two Forms arranged by the Meteorological Office and the Committee of the Society; and which are administered by observers of proved experience, attainments, and skill, employing compared and verified instruments of the highest character, and submitting their observations to the supervision and approval of our Council. In reference to the character of these parent stations, it will be sufficient to state that they have been inspected and approved by our very exact and most careful Secretary, Mr. G. J. Symons; and I may perhaps be permitted to add in emphasis to what has already been said in the Report about this, that the Society is very largely indebted to the public spirit and unflagging energy of this officer for the efficient way in which, at considerable cost, both of time and labour, to himself, this altogether indispensable work of supervision, inspection, and verification has been performed. Mr. Symons, in the prosecution of this work, has very judiciously prepared for permanent preservation in our archives a most interesting series of sketch surveys and plans of the instrumental arrangements of these observatories.

It gives me some personal pleasure to have further to allude in this place, to another promise of co-operative alliance and strength, which has grown out of the proceedings of the past year, in the arrangements which have been entered into with the Meteorological Office of the Government. A plan has now been matured which provides that the observations of certain of our most suitable stations shall be contributed to the returns of the Government Office, with the reservation to ourselves of all responsibilities and rights in these selected observations, and with a payment from the Office to the revenue of the Society of a sum which shall suffice to cover the cost of the work entailed in this contribution. It will be to the material benefit of our Fellows that printed copies of these returns, with other analogous and closely allied records, will be available for periodic issue to them at the bare cost of paper and press-work. This plan of alliance, it will be found, has been so carefully arranged by your Council, that our own individual and independent action is in no way affected in the system of co-operation that has been devised; and there is reasonable and fair ground to hope that the "treaty alliance" which has thus been established between neighbouring and friendly powers will mature to much larger proportions, to the mutual advantage of both parties in the compact. The methodical organisation and subsequent discussion of these returns, which is now contemplated, may possibly go some way to redeem meteorological science from the reproach that I found occasion to allude to recently as having been charged to its account, of "heaping millions of useless observations upon the millions that have been already accumulated." At any rate, these authorised and carefully inspected observatories have been planned upon a geographical base adapted to secure a full and comprehensive grasp of the meteorology of England and Ireland, and which will be further filled in by other stations, with similar forethought and care, as the best and most available situations for these extensions can be determined: and the returns from these stations, it is hoped, will ultimately be grouped and ab-

stracted in the printed Reports as to enable the great leading features of climate and season to be apprehended at a glance.

In speaking of the success which has attended our effort during the past year to enlarge the sphere of our alliances and sympathies, I cannot refrain from adding to the catalogue of my congratulations an expression of the satisfaction both the Officers, and the Council and Fellows, feel in the large and distinguished addition that has been made to our phalanx of Honorary Members. It will be enough in this presence to recal once again the honoured and world-known names that have already been placed before the Meeting in the Report of the Council, those namely of Buys Ballot, von Freeden, Jelinek, Kingston, Von Lamont, Loomis, Mohn, Neumayer, Plantamour, C. Sainte-Claire Deville, Secchi, and Wild. But it may not be altogether out of place to remind this assembly that the accession of these Honorary Members means that we have this year been fortunate enough to extend the right hand of close fellowship from eastern Europe to the lands west of the Atlantic, and from the shores of the Baltic to the coasts of the sunny Mediterranean. The countries that we connect in friendly communion with ourselves by this grasp are, Norway, Russia, Prussia, Bavaria, Austria, Holland, France, Switzerland, Italy, the United States and Canada.

The influence of meteorological conditions upon the public health of civilised communities has again been very remarkably illustrated during the current season of cold and gloom. At the beginning of the past month of December, the temperature, after a comparatively mild period, suddenly fell many degrees below that at which water freezes, and the mean temperature of the day remained below 32° F in London for two days and nights. The mortality in the metropolis was immediately increased nearly two thousand over that which had occurred within the same period immediately before. The mean temperature in London ending with the first week in November, was 51°·6, and the deaths in that period amounted to 5,450. The mean temperature in London for the next month was 39° and the deaths for that period amounted to 7,359. Of this large number, 38 per cent. took place among children under 5 years of age, and 49 per cent. among persons exceeding 39 years. The deaths from diseases of the respiratory organs increased at this time from 1,581 to 2,910. The average weekly mortality in London, if deduced from a period of 16 years, is, 1,569. The mortality for the week ending December 12th, was 2,082. The 'Lancet,' in contemplating these facts, drew attention to an old investigation of a very notable character, which demonstrated that the mortality caused by cold is twice as great under the age of 21, as it is between 21 and 40, and that after 40 the risk to life from this cause is doubled every nine years. In a thoughtful and very excellent article, printed in the 'Times' about the 16th of December, in which the main object of the writer was to point the moral, for the behoof of the general laity, that in cold weather people, and especially the weak members of the community, should husband their resources of natural and artificial warmth, there occurs one passage that so forcibly and so clearly puts the importance of a proper and intelligent apprehension of the physiological in-

fluence of cold upon the living animal economy, that I cannot refrain from reproducing it in this place, in order that so admirable a piece of hygienic wisdom may have such endorsement as our notice of it upon this occasion can confer. The passage to which I refer is to the following effect :—

"The struggle of the human body against cold, it must be remembered, is a mere matter of weight, measure, and account. Let it be supposed that a given person, taking his ordinary diet, can produce an amount of heat which may be expressed by 100. By taking an excess of food he may perhaps produce more, say 120; but his range of power is limited by his digestion. If he is put to live in a cold house, and is imperfectly protected by clothing, the surrounding air carries his heat away as fast as it is formed, and he has consumed say 60 of his 120 before mid-day in keeping up his temperature to its natural level. In the afternoon he has to go out of doors into an air still colder, and he has only 60 of heat-producing power with which to resist the external weather. If he had previously been in a warm in-door atmosphere, he would have had his 100, or 120, still available. A person who is unnecessarily cold within doors is like a spendthrift who wastes his capital in his youth, and has no income left for his old age. To keep warm, to retain heat within the body instead of spending it, is just as judicious as to husband money with proper economy; and every one who wishes to be able to face cold with impunity should regard the avoidable expenditure and loss of heat as foolish extravagance. To attempt to "harden" people, and especially children, against cold is all nonsense. Cold can only be resisted by vital combustion within the body; and the body can only burn what is supplied to it, and that only in the measure of the capacity of the furnace. Every one who is exposed to cold draws upon his heat-producing power for his means of resistance, and has so much less remaining with which to meet the next demand. Persons who live in warm houses, and who wear warm clothing, may go out into any degree of cold with impunity; while those who suffer themselves to be half chilled at home, must expect to be half frozen when they are abroad. Modern science teaches this with no doubtful voice; and even if she did not do so, the experience of the instincts of those who dwell in cold countries would be conclusive on the point."

The fact which is so prominently marked in this quotation is undoubtedly one of the main causes of danger in meteorological vicissitude. Risk is not incident to going suddenly from a warm room into a cold outer atmosphere. When actually incurred, it is due to the other conditions that are superadded to such change of position. The popular, and almost universal notion that it is dangerous to go out from a warm room into cold air arises from the misapprehension, and fallacy, of confusing such transition with the leaving a heated room, where fatigue and perspiration have been induced, with insufficiency of warm clothing, and in that state encountering the chill of a cold draught, or of a very low temperature. That, however, it will be observed, is altogether a different affair, and a very insufficient ground for the most reprehensible myth which has been fabricated from it,—namely, that the delicate and young can be hardened by exposure to cold. The frequent

vicissitudes of the English climate are undeniable features in its meteorology; but my own experience, gained in a large degree in what is popularly termed a more genial, and a less changeful, climate, leaves me with a strong conviction that even in England we gain quite as much as we lose, if we understand the matter aright, and bring into play such expedients as our civilised facilities enable us to apply. There is, in reality, atmospheric vicissitude in nearly all situations, excepting in some of the most intolerable insular, or pseudo-insular, climates. In the lauded climate of Natal, where there is almost an entire absence of frost, and where bright sunshine is the normal condition of the winter, a fall of from thirty to thirty-six degrees of temperature within a few hours is by no means an infrequent occurrence. Such vicissitudes of temperature are, indeed, the proper conditions that hang upon the "great breathing play" of the atmosphere;—the alternate swayings to and fro whereby its inherent purity, and essential standard of physical condition, are preserved. The vast lungs of the earth, by some hidden mechanism, as yet but imperfectly seized by the intellectual grasp of meteorological science, although so pertinaciously sought after, and so ardently desired, are continually wafting to and fro the warm currents from the tropics at low latitudes and the cold blasts from the higher parallels. The diurnal oscillations of the barometer are the normal and visible signs of these respiratory heavings of the earth, while the periodically alternating northeast and southwest winds are the strained and forced movements of the breathing. A very shrewd and sagacious observer of all that relates to climate and weather, my estimable old friend Dr. Charles J. B. Williams, has been in the habit, through nearly half a century of professional and scientific life, of drawing attention to the almost regular recurrence of these warm and cold "sets" of the air, and has acquired considerable facility, in all but exceptional times, when the perturbing impulses overbear the more orderly forces, of approximately anticipating the periods of change. The genial, and inclement fits of the weather so strikingly marked in the British Isles, are undoubtedly due to these periodical reversals of the great dominating currents of the air. When the secrets of this notable piece of pneumatic mechanism have been tracked to their hidden lair, and when a more intelligent obedience is given by the general community to the great laws of physical necessity that physiology and meteorology are codifying by their conjoint and consentaneous observation and study, the exceptional death-rates which are now laid at the door of cold, will certainly be transferred, in a very material degree, to the account of human perversity or ignorance. It is well known that the epidemic fevers which claim a constant and serious tribute from human life, are compensatory powers in the balance. They are less fatal in seasons of cold. In a suggestive and deeply interesting paper, printed in the 'Sanitary Record' of the 14th of November last, our long tried colleague and excellent friend and Honorary Secretary, Dr. Tripe, points out that of 81,834 deaths within the districts of London from scarlatina, 14,067 occurred in spring, 20,826 in winter, 18,829 in summer, and 29,112 in autumn, that high number being, it will be remembered, in a large degree

the crop reaped from seeds sown in the still hotter season of the preceding summer. The greatest mortality in scarlet fever occurs in the season when the mean temperature lies between 49°·6 and 56°·9 A mean weekly temperature below 40° is invariably coincident with a concomitant decrease of mortality from this disease.

Considerations of this class bring very forcibly home to our apprehension the great practical fact which it has been my main object to introduce by these remarks, namely, the pressing need that there is for a scientific and systematic study of the health and death-rates of the human community in connection with meteorological conditions and vicissitudes, a work that can in no way be more efficiently and satisfactorily carried out than by enlisting the co-operation and service of the intelligent and specially trained gentlemen who, as the Medical Officers of Health, have charge of the sanitary condition of large and crowded sections of the community. I am sure that I can give but a very insufficient expression to your appreciation, as meteorologists, when I thus mark our earnest desire to see this urgent and very rapidly enlarging need adequately provided for, and when I thus publicly place on record the very cordial satisfaction with which we hail the recent important and welcome accession of public officers of health to the ranks of our fellowship.

In connection with this allusion to the physiological influence of meteorological vicissitude, I may perhaps take this occasion to remark, that I think a Meteorological Society which sits by incorporated authority beneath the shadow of the Victoria Tower has, in a certain sense, inherited the task which was so auspiciously commenced by Luke Howard sixty-eight years ago. The climate, and more especially the winter climate, of London has now become a matter of immediate daily interest to some three millions and a half of people, and it is certainly one that admits of some more exact and definite form of description and expression than has yet been obtained. During the past year we have had one notable contribution in this direction, in the series of papers, by one of our Fellows, on the Weather of Thirteen Seasons in London. From his observations of 13 years, Mr. Strachan gives 40° as the mean winter temperature of London, and 8°·5 as the mean winter daily range; but he points out that the mean temperature of either of the winter months may vary as much as 13°, and that the mean monthly temperature in London may be as low as 33°·6, or as high as 46°·4. According to Mr. Strachan, rain falls in winter in London, upon an average, on 47 days, and snow on 7 days. There are during the season 58 occurrences of mild equatorial winds, and 27 of cold polar winds. The mean temperature for the months of December and February is 41°, and the mean temperature for January is 38°·5, or 2°·5 lower. Rain may be expected to fall on 15 days in December; on 17 days in January; and on 15 days in February. Snow may be looked for on 2 days in December, on 3 days in January, and on 2 days in February. During the entire period of 90 winter days there should be only 2 days of unclouded sunshine; and 55 days of unbroken cloud; 33 days giving passing glimpses of sun among broken

clouds. These figures may possibly require either confirmation, or modification, from a more extended series of observations, and perhaps from a more exhaustive discussion; but even in their present form they are full of suggestion, and of marked interest.

It will be remembered that one of the most remarkable contributions to the knowledge of the climate of London made since Luke Howard's time, was the paper communicated by our veteran and distinguished colleague, Mr. Glaisher, and printed in the 'Proceedings' of the Society for February 1865, in which was given the mean temperature at Greenwich for every day in the year, deduced from Greenwich observations for 50 years. The Fellows will be gratified to learn that Mr. Glaisher has a most interesting and important addition to this series of the daily temperatures for another period of ten years nearly ready for printing.

The Society will be aware, apart from the notice of the matter that is contained in the Report of the Council, of the effort that has recently been made to re-awaken interest in the observation of periodical phenomena that are affected by the march and diversity of the seasons. Attention had been drawn to the action of continental meteorologists in this direction by a Report presented to the Meeting of the British Association for the Advancement of Science held at Cambridge in 1845. A review, and reconsideration, of this Report at once made it manifest that the proceedings adopted by continental naturalists but imperfectly met the requirements of our own case, and it was further felt that it was of some practical importance that the observations in the various departments of nature should be limited as far as possible to representative objects, instead of being spread over a larger and more comprehensive series. The Committee of the Society, contemplating the work from this point of view, was fortunate in securing the advice and co-operation of some distinguished naturalists eminently qualified to give them the assistance they required. Professor Newton, of Cambridge, who has himself contrived, and carried out, a very effective plan for the symbolical record of the habits of birds, has in connection with this matter supplied a list of the species which he recommends for observation in connection with the recurrence of the seasons, and has accompanied his list with some very valuable practical remarks. Mr. McLachlan, of the Royal Horticultural Society, has rendered the same service for insects; and the Rev. T. A. Preston, of Marlborough College, who has enjoyed a very exceptional advantage in the prosecution of his researches into the habits of plants on account of the large staff of lynx-eyed observers that he has at command to scour the country for miles around in the boys of the College, has furnished a list of 71 standard plants most deserving of notice, and he has supplemented this list for purposes of reference and check with a table giving the earliest and latest dates of the flowering of some of the most characteristic of the series according to Marlborough experience gleaned during ten years. Professor Thiselton Dyer, of the Royal Horticultural Society, has also furnished some valuable remarks. I commend these very valuable communications to your notice, and at the same time ask your permission to record our deep sense of the service we have received at the hands

of these gentlemen. But while performing this act of most pleasant duty I have also to remark that these contributions are by no means to be looked upon as settled and final instructions, they are merely suggestions thrown out in breaking new ground, and are, indeed, still under discussion and revision. They are avowedly intended, in the main, to direct and stimulate the attention of a new cohort of observers, who, in the end, will have to establish their own methods. Mr. Preston remarks, in regard to his own very excellent and well-considered communication, that at present the whole subject must be held to be in its infancy. Professor Newton, in alluding to his own experience, takes occasion in one place to say that he has been led to the conclusion that birds are not materially affected by accidental vicissitudes of weather, but that their habits are obviously ruled by the grand march of the seasons, which is independent, and external to, these brief incidents of change. It may perhaps be worth while, in reference to this remark, to point out that this is the very consideration which commends observations of this character to the notice of meteorologists. The object of the observation of what is now termed phenological phenomena is to supplement the records of thermometers and kindred instruments by the aid of a mechanism that is more exquisitely sensitive, and more refined, than any that can be constructed of mercury, spirit and glass;—namely, the delicate organisation of living structure. The impressions which are made upon this structure are registered in the habits and movements of the creatures that are formed by its instrumentality. Through such registers indications of the diversity of seasons from year to year may be secured, which might be overlooked, or lost, if these refined supplementary observations were not made. The meteorologist proposes, then, by these observations to ascertain, not how living plants and animals are affected by changes, or by extreme conditions of weather,—but how irregularities of the seasons in different years are manifested by unusual proceedings on the part of the sensitive organisations that are dependent upon their transition and recurrence for their well-being, and for the performance of their functions.

The care that has recently been given by the Editing Committee, and by the Council, to introduce a more rigid economy into the production of the Journal is worthy of the notice of the Fellows, on account of the success that has attended the efforts of their Officers. The Report of the Council shows that very nearly as much printed matter again is now issued in the Journal without any material addition to this branch of the expenditure. This spirit of economy has, however, not been exclusively confined to the printing. Notwithstanding the maintenance of the Office and Library, and of the salaried Assistant Secretary and Librarian, and some further special provisions for exceptional expenditure connected with the development of other works of usefulness, the income of the Society would have been in excess of its expenditure but for the charge of inspecting and starting the new observing stations; and even with this judiciously incurred outlay, the excess which has to be provided for independently of current income is of a very trifling amount.

It has, however, been with some measure of regret, that in its fealty to this principle of economy the Library Committee has felt itself constrained to defer a work that is of some importance to the full utilisation of the Library of the Society, namely, the printing of a Catalogue of its Books. But in the mean time, as a step towards the desired end, the books have been reduced to excellent order, and a slip catalogue has been prepared in manuscript which will answer all the purposes of a Library Catalogue. The Society is indebted to the industry and care of its Assistant Secretary and Librarian for the satisfactory accomplishment of this task. In a Meteorological Library, where many of the books and documents must of necessity be of a fragmentary and desultory character, the value of the accumulated material is almost entirely dependent upon its ready accessibility, and the formation of a good catalogue is, therefore, an affair of indispensable necessity. It is to be hoped, however, that the acquisition of a complete library of standard and classical works of Meteorological Science, over and above the waifs and strays of observational record and of current work, is an event that may be now definitely contemplated by the Society.

There is one topic which was only touched by a passing notice in the Anniversary Address of last year, on account of exigencies of time and space, but which it would be a reproach to your President, just at this time, not to allude to more definitely. I refer to the probable connection of changes in the physical condition of the sun with the vicissitudes of meteorological conditions upon the earth. I therefore pray your indulgence if I devote the concluding words that can be allowed me upon this occasion to this theme, enlarged and illuminated as it has recently been by some of the most brilliant discoveries, and some of the most marvellous deductions of the age.

It has long been understood that all the varied phenomena, involving movement and change, which take place upon the earth, are as absolutely due to the glorious luminary which is the centre of our world-system, as are the light and heat which we receive more palpably and demonstratively from that source. This statement is to be accepted, not in any merely imaginative or qualified sense, but as a hard and sharply-defined physical fact. If the solar influence were cut off, in direct negation, from the earth, its surface arrangements, now so instinct with elasticity and movement, would be rapidly changed into a mere dead precipitate of motionless, unchanging matter;—a true lifeless chaos in the most rigid acceptation of the term. In the far polar regions, where the immediate solar influence is withdrawn for months at a stretch, a near approach to this stagnant state of material nature is actually seen during the long sunless period. The air, and a few lingering sparks of animated existence, are the only objects that retain the power of movement, and of material change. The sun may thus be looked upon as the great potential source of energy, vitality and power; the earth as the passive recipient of the motive emanations from the sun, so fashioned and framed that it can be organised and vitalised to useful purpose by their operations.

Now the first marvellous perception that comes over the mind of the

thoughtful inquirer, when he ventures to penetrate a step further into this weird region of human knowledge, is the tremendous dimension of the mass which is devoted in this scheme to the initiation of motive energy, compared with the passive material which has to be awakened by its agency into activity and life. The visible sphere of the solar luminary, apart from any outlying appendages that fringe round its familiar face, is, it will be remembered, nearly one million of miles across, and it has a circumference nearly as vast again as the orbit of the moon. It is 1,278,000 times as large again as the earth; and, in its own central and grand predominance of might, six hundred times more huge than the entire family of primary and secondary orbs that are hung upon its support in the firmament; and of those orbs the large outer planets are most probably subsidiary and supplementary heat-suns, aiding the force-initiating efforts of the central luminary, rather than members of the world-brotherhood that are recipients from it of power. So preponderant and mighty in the great scheme of Nature are the active elements, in comparison and contrast with the passive constituents, of the combination.

The heat which is present at the luminous surface, or photosphere of the vast solar sphere, is most probably forty-five times more intense than the heat which is generated in the best furnaces of man's machinery. Sir William Thomson, an altogether competent authority, estimates it at 4,500° of Fah. The heat power which arrives from the sun upon the earth would be enough, according to a recent calculation, to keep 543,000 millions of steam engines of 400 horse-power working continuously, although the earth only receives the 2,138 millionth part of the heat which issues from the central source. The material substance of which the sun is composed is, no doubt, under these conditions, molten, or vaporised by the high temperature which it has to endure, and is shining in virtue of the intensity of its heat. The sun's surface is a sea of liquid fire, in which the most stubborn metallic and rocky substances are fused, and in some measure sublimed into vapours which glow by their own inherent splendour. By the aid of the spectroscope bright flames of this character are actually seen leaping up from the sun's surface 50,000 and even 100,000 miles high. Columns of luminous gas of these stupendous dimensions are, from time to time, shot forth from the molten sea, rolling back the outer surface of incandescent brilliance, and leaving dark chasms below, that then have to be gradually filled in by the regurgitation of the shining whirlpool. These dark chasms, opened out in the flame-sea of the sun by its gaseous eruptions, are seen from the earth as dark spots drifting across the solar face. Some of these chasms are of almost inconceivable dimensions; one that was observed upon the sun on the 30th of August, 1839, was found to be 187,000 miles across, and to have an area of 25,000 millions of square miles, and could have swallowed up in its cavernous depths many score Earths as easily as a bucket could swallow up a handful of peas. Many of the stubborn elements which support these solar fires are now known from the researches of spectroscopists. They are such familiar bodies as sodium, magnesium, calcium, aluminium, iron, manganese,

and hydrogen. The light which is emitted from the sun is generated by the heating of the unvaporised particles of the denser of these bodies in glowing flame, as particles of unvaporised carbon are heated by the glowing gas from artificial hydro-carbon sources of illumination. Solid nodules of the denser elements are even ejected before the outbursts of the flaming gas so far that they travel beyond the reclaiming power of the sun, and then constitute streams of trailing meteors.

It is by operations of this class, imperfectly fathomed as they have yet been by the intellect of man, that the sun is kept in its state of seething activity. It is the remote trembling of these mighty outbursts in the solar ocean of flame that awaken movement and life in our changing and growing world. As, then, these marvellous operations, now traced in unceasing progression in the sun, are thus intimately connected with the physical changes evoked upon the earth, there is the most obvious reason why the opposite ends of the chain of causation should be watched, and compared, in any scientific effort to arrive at a comprehensive theory of their nature and meaning; and this, therefore, is summarily the essence of the new dogma which prescribes that the study of the solar physics must henceforth form a part of meteorological investigation, and that the spectroscope shall henceforth be installed by the side of the thermometer and barometer. What is essentially desired by the advocates of this extended method of procedure is, that cycles of exceptional phenomena observed in the sun shall be discussed and compared with recurring cycles of meteorological vicissitudes. The ascertained cyclical recurrence of maximum and minimum periods of sun-spots has very naturally suggested itself, in the first instance, as one very obvious comparison that may be instituted with the recurring cycles of maximum and minimum temperature upon the earth, and of maximum and minimum rainfall. It is altogether rational to conceive that any period which is marked by unusual activity of eruptive outbursts, and of flame production, in the sun, may have its concomitant and correlative season of increased warmth and aqueous evaporation upon the earth. This comparison has, accordingly, been entered upon by various observers. As far back as 1852, M. Wolf, Director of the Observatory of Berne, in a communication to M. Arago, which was printed in the 'Comptes Rendus' of the 8th of November in that year, observed that he had found, by a careful examination of the records of sun-spots, made from the time of their first discovery, that there was an apparent return of maxima and minima periods of the occurrence after an exact interval of 11·111 years, and that the years on which the sun-spots had been most frequent had also certainly been the driest and the most fertile. At a twelve-years' later date, Professor Wolf announced that he had made out a still longer, and more comprehensive, cycle of 56 years, which had its maximum in 1836; and that the frequency of auroral displays was very much in the ratio of the occurrence of sun-spots. In the year 1869, 224 groups of sun-spots were noted at the Kew Observatory, and it was remarked that on no single day throughout the year had the sun been seen without a spot upon its face. In the year 1870, 403 groups were

catalogued, and again no single day was found on which the sun's disc was without a spot. It was also remarked that the number of groups seen in 1870 far exceeded the number in any previous year, and that the absolute magnitude of the different groups, and the amount of surface covered by them during any fixed period of the year, were altogether without precedent. Many of the groups completed three, and some four, revolutions with the sun's surface before they collapsed, or dissolved away. Towards the end of the year the frequency and abundance of the spots was still upon the increase, and it was conceived that the true maximum period had not even then been finally attained. The year 1870 was thus marked at Kew as having been characterised by an exuberance of solar energy which was without any parallel since the commencement of the observation of solar spots in the year 1825. In 1871, there was still no day in the year on which the sun was seen at Kew without a spot, but only 271 spots were catalogued during that year. The frequency of the spots was obviously on the decline, and it was clear that the size of the spots was also diminishing with their frequency. Mr. Meldrum, of the Mauritius Observatory, communicated to the Meeting of the British Association for the Advancement of Science, at Bradford, in 1873, a paper which seemed to indicate that a maximum of cyclones, and a maximum of rainfall, in the Indian ocean, are coincident with a maximum occurrence of sun-spots. Sir David Brewster, in connection with some of his early scientific speculations, threw out the idea that sun-spots would alternately be found to excel in heat-radiation as much as they were deficient in the emission of light. Dr. Lohre, of the Bothkamp Observatory, has quite recently taken up this notion, and devised a plan which he believes will be efficient for testing the question by means of chemical agency. He places a paper saturated with chloride of cobalt in a telescope where a focal image of the sun can be received upon it, and he finds that the image which is impressed upon the paper gives manifest indication of being less powerfully affected by heat-radiation from the limb of the sun than it is from the central parts of the disc. The paper is red when it is prepared, and the red is turned to blue on exposure to heat, with a rapidity which is proportioned to the intensity of the calorification. At the time when he made this communication of his first success he had, however, not had any favourable opportunity for testing his process upon any sufficiently developed sun-spot.

The comparison of meteorological cycles with these sun-spot phenomena has not yet been sufficiently carefully and extensively carried out to yield any notable results; and it must here be remarked, that the task which the meteorologist has to perform in the institution of this comparison is a very much more difficult and elaborate one than the mere cataloguing of sun-spots. On the very threshold of his labour, he is met by the embarrassing fact, that if the great solar disturbances of the character which has been described do affect the seasons of the earth at all, they must produce their effect, in a greater or less degree, simultaneously over the entire terrestrial sphere, and not especially and exceptionally at one part which has been occu-

pied by adequate and systematic meteorological observation. The subject is also one which substantially extends very far beyond the mere discussion of sun-spots. Methods of more exquisitely refined and more comprehensive observation are now being rapidly developed, under the impulse which has recently been given to this noble branch of physical investigation. Thus, for instance, our distinguished Honorary Member and ally, Padre Secchi, at Rome, some little time since had observed 2667 red prominences in the sun with the spectroscope during 184 days, and had satisfied himself that the highest prominences were those that had generally the largest lateral dimensions, and that the regions of the sun which were torn by these most violent eruptive disturbances were also those which were richest in the light-waves or bright faculæ. The Kew observations in 1870, again, showed that at the time when the solar spots were most frequent and abundant, the solar eruptions presented themselves in higher latitudes than those in which they ordinarily appear, and that such exceptional polar spots were more short-lived in proportion as they were further away from the equatorial region of central activity, and that they were the effects of very sudden, and comparatively very violent, convulsions. One group of spots, which was visible in these high parallels in March, left a ridge of faculous matter behind it, long after its disappearance, covering an area at least twenty times as large as the spot itself, and spreading out along a parallel of latitude almost in the fashion of a cometary appendage.

In the face of these various tokens and signs, meteorologists may as well at once accept the fiat of fate, and admit that a new field of very hard work is opening out to them. The meteors, but recently relegated to the charge of astronomy, have returned from their temporary exile to claim renewed naturalisation amongst us on the ground of their descent and parentage, and to tell us that henceforth a close study of the aspects and internal economy of the sun will have to be admitted among the incidental processes of scientific meteorology, if only on account of the bearing they possess upon an intelligent and thorough understanding of the physical conditions, and transmutations of state, in the earth's atmosphere. Even though weather-prophets may not be able to read in the sun's face the forecasts of tempests, and of benign seasons, meteorologists will find there an interpretation of physical secrets that belong properly to their domain, and a field of philosophic generalization that will add a power and dignity to their own grasp of their special methods of intellectual research.

REPORT OF THE COUNCIL,

Read at the Annual General Meeting, January 20th, 1875.

This has been emphatically a year of work for the Council, as not only have they held eleven Meetings, but three Committees nominated by the Council out of their own number have met still more frequently.

The want of some smaller body than the Council to consider and report on

many of the propositions which are made to them, and in a few instances to consider other matters arising out of the ordinary course of the business of the Society, rendered the formation of a House Committee absolutely necessary. This Committee, consisting of seven Members, has met at least once in every month during the past Session, and presented several important reports to the Council. An Editing Committee has been re-appointed to superintend the publication of the Quarterly Journals, which have contained much more matter than heretofore. As all the Fellows receive copies of these, there is no need to make further allusion to them. Another most useful Committee was appointed to prepare the Forms to be used by the observers of the Society, a report of which, especially in connection with the arrangements concluded with the Meteorological Office, will be laid before you. The Council feel that they would not be doing their duty if they did not recognise the great assistance which they have had from these Committees.

One matter on which a considerable amount of time has been bestowed, was a revision of the Bye Laws, which had remained almost unaltered for many years, and had become somewhat unfit for the wants of the Society in its present advanced state. The alterations consisted chiefly in rendering them more condensed and simple, so that at the Special Meeting in June last, when they were confirmed, no emendation whatever was proposed by any of the Fellows.

Amongst other alterations in the Bye Laws, the Form of Diploma to be granted to Honorary Members was rendered more conformable to present usage, and a handsome design was lithographed and printed on thick paper. The list of Honorary Members being small, it was also decided that the number settled by the new Bye Laws should be nearly filled up, and twelve names were very carefully selected, so as to include some of the most eminent foreign Meteorologists. The selected names are the following:—

Prof. C. H. D. Buys Ballot.
Herr Wilhelm von Freeden.
Dr. Carl Jelinek.
George T. Kingston, Esq., M.A.
Dr. Johann von Lamont.
Prof. Elias Loomis, LL.D.
Dr. H. Mohn.
Dr. George Neumayer.
Dr. E. Plantamour.
Mons. Charles Sainte-Claire Deville.
Padre Angelo Secchi.
Dr. Heinrich Wild.

As the Public Buildings in Burlington House were almost finished in the early part of the year, the Council deemed it advisable to renew their application to the Government for accommodation for the Society. It will be in the recollection of many Fellows that when a Deputation waited some years since on Mr. Layard, then Chief Commissioner of Works, on this subject, a

promise was given that the application should be considered. The Council, therefore, prepared a Memorial in April last, which was presented through Sir Antonio Brady to the Chief Commissioner, who directed a reply to be returned to the effect that "owing to the demands of the Public Service, there was no space available which could be allotted to the Society." There is, therefore, no chance of our obtaining the rooms which we hoped to have had.

The Council have again to acknowledge their obligations to the Institution of Civil Engineers for the ample accommodation which they have kindly afforded to the Society. They have also to report several further improvements in the Society's Office and Library, at 30 Great George Street, so as to give more accommodation to the Fellows visiting it, and to render it fit for special Council Meetings. An additional set of shelves has been put up for the reception of the numerous books, &c., presented to the Society, and for the stock of 'Proceedings' and the 'Quarterly Journal' which have been received from the late Publishers. As may be seen from the list of Donations printed quarterly in the Journal, many valuable additions have been made to the Library during the Session by different Societies, Institutions, and gentlemen, especially by Mr. Symons.

The following Instruments have been presented to the Society, and are exhibited in the Library:

Improved Vacuum Solar Radiation Thermometer.
Hollow cylinder spirit Minimum Thermometer.
Both by Mr. Hicks.
New Mercurial Minimum and Maximum Thermometer.
By Mr. Casella.

Also a Kew Standard Thermometer, prepared expressly for the Society for comparing the Thermometers of the observing Fellows.

The Assistant Secretary has prepared a Catalogue of the Library, which will be printed at an early date. He has been appointed Librarian in the place of Mr. Gaster, who, in February last, resigned the office which he had held for six years with great advantage to the interests of the Society, rendering service which the Council desire to acknowledge with thanks.

The Council have also arranged a better system of exchange with various Institutions and Observatories, so that the contents of the Library may be more valuable to the Fellows, and eventually become worthy of the Society.

At the request of the Council, the House Committee prepared the following regulations, which have been adopted by the Council, for the circulation of books belonging to the Society:—

1. The Library is open for Readers, and for the issue and receipt of Books, from 11 a.m. to 5 p.m., except on Saturdays, when it is closed at 2 p.m.

2. No Book may be taken from the Library until the title has been entered for issue by the Assistant Secretary in a book provided for the purpose, with the signature of the Fellow borrowing it placed against the record.

3. Fellows wishing to borrow Books and not able to apply personally,

may send a written application for them to the Assistant Secretary, and may have the Books forwarded to them on providing payment of postage or carriage.

4. Fellows may not have more than two volumes from the Library at any one time, without special permission of the President or either of the Secretaries. Books borrowed by Fellows may not be retained longer than one month without the renewal of the issue.

5. All Books and documents in the hands of Fellows are to be returned to the Library one month before the commencement of each Session, to allow a yearly scrutiny of the condition of the Library.

6. Books marked as "reserved for reference," unbound publications, and manuscripts, are not allowed to go into circulation, except under special permission of the President or either of the Secretaries.

7. Fellows are responsible for the safe keeping of Books in their possession, and in case of injury will be required to repair the damage, to pay the value of the injured Books, or replace them, at the discretion of the Council.

The House Committee, at the request of the Council, very carefully revised the "Free List," and recommended that the 'Quarterly Journal' shall be sent to the following Institutions, which was adopted. The list, as set out below, shows that the publications of the Society are distributed over a very large part of the civilised world.

Adelaide	Observatory.
Bombay	Colaba Observatory.
Brussels	Académie Royale.
,,	Observatoire Royal.
Calcutta	Meteorological Office.
Christiania	Norske Meteorologiske Institut.
Copenhagen	Danske Meteorologiske Institut.
Cracow	K. K. Sternwarte.
Dorpat	K. K. Universität.
Dublin	Royal Dublin Society.
,,	Royal Irish Academy.
Edinburgh	Scottish Meteorological Society.
Fiume	I. R. Accademia di Marina.
Geneva	Société de Géographie.
Greenwich	Royal Observatory.
Hamburg	Deutsche Seewarte.
Hobarton	Royal Society of Tasmania.
Kew	Observatory.
Klagenfurt	Sternwarte.
Lisbon	Academia Real das Sciencias.
Liverpool	Bidston Observatory.
,,	Literary and Philosophical Society.

London	Editor of "Nature."
,,	Institution of Civil Engineers.
,,	Meteorological Office.
,,	Royal Astronomical Society.
,,	Royal Institution.
,,	Royal Society.
Lyons	Commission Météorologique.
Madrid	Observatorio.
Manchester	Literary and Philosophical Society.
Melbourne	Government Observatory.
Milan	Osservatorio.
Modena	Osservatorio.
Munich	K. K. Sternwarte.
Newhaven, U.S.	Prof. Twining, Yale College.
Oxford	Radcliffe Observatory.
Paris	Observatoire National.
,,	Observatoire de Montsouris.
,,	Prof. André Poëy.
,,	Société Météorologique.
Philadelphia	American Philosophical Society.
Prague	K. K. Sternwarte.
Rome	Osservatorio del Collegio Romano.
St. Petersburg	Physikalisches Central Observatorium.
Stockholm	Meteorologiske Institut.
,,	K. Svenska Vetenskaps-Akademie.
Sydney	Government Observatory.
Tiflis	Physikalisches Observatorium.
Toronto	Education Office.
,,	Magnetic Observatory.
Upsala	Observatoire de l'Université.
Utrecht	K. Nederlandsch Meteorologisch Instituut.
Vienna	Hohe Warte.
,,	Oesterreichische Gesellschaft für Meteorologie.
,,	Dr. Carl Fritsch.
Washington	Chief Signal Office.
,,	Smithsonian Institution.

The Council have now to invite the attention of the Fellows specially to the action of the Form Committee. It will be remembered that in the Report read at the Annual Meeting, June 18th, 1873, it was stated that "the Council have deemed it desirable to appoint a Sub-committee to prepare a Form for observations for the use of the Fellows." After much deliberation this Committee has prepared two forms,—a large one for observations at stations of the Second Order, and a smaller one at stations of the Third Order, in the sense attached to these terms by the Vienna Congress; and as the large Form is identical with that adopted by the Meteorological Office and

the Army Medical Department, there is a fair prospect of uniformity in recording observations being attained. The smaller Form is intended to furnish data for supplementing special investigations.

This Committee subsequently presented a Report to the Council respecting the organisation of a series of Meteorological Stations; and recommended the following conditions:—

"1. It is expedient that observers should be led to look upon the acceptance by the Society of their records as an honour conferred upon them. The more carefully observers are selected by the Society, and the more precise the rule of observation that is adopted, the more honourable will it be felt by observers to have the work in their hands, and the more certainly will there be ready candidates when vacancies in the staff occur.

"2. It is imperative that none but standard and verified instruments be used, and that every observer possess at least a barometer, dry and wet, maximum and minimum thermometers, and a rain-gauge.

"3. It is desirable that there be also a sun maximum and a grass minimum thermometer at each station.

"4. It is imperative that a Stevenson's or analogous thermometer-stand be provided at each station, and most desirable that it be not placed within 10 feet of any wall.

"5. The rain-gauge, when placed with its orifice 1 foot above the ground, should have 60° of zenith distance clear in all azimuths.

"6. The observer should be able and willing to fill up completely the Society's large printed Form with observations taken twice daily, viz. at 9 a.m. and 9 p.m. local time.

"7. In selecting observers, where other circumstances are equal, preference will be given to those who can fulfil the following conditions:—(1) the possession of old records kept upon the above system; (2) the fact of a trained assistant being ready in case of illness or absence; (3) the observer being a Fellow of the Society."

A number of stations were suggested at which it was thought probable the observers would carry out the contemplated observations and proposed requirements. The Council thereupon voted a sum of £50 to a Sub-committee to carry out the organisation of a small series of observing stations for the Society.

This Sub-committee has presented the following Report to the Council:—

"*Report of the Sub-Committee (consisting of Messrs. Eaton, Scott and Symons) appointed by the Council to superintend the establishment and organisation of a series of new stations.*

"Your Committee, duly impressed with the consciousness that these new stations must be in every respect as well arranged and equipped as second-order stations could be, devoted much time to the consideration of the requirements which should be held to be absolutely imperative. A few of

these conditions may be mentioned, but many others will be revealed by examination of the reports* upon the several stations.

"I. *Instruments.*—No observer was to be accepted unless he possessed, or was willing to procure—

Standard Barometer.
Dry Bulb Thermometer.
Wet ,, ,,
Maximum ,,
Minimum ,,
Rain Gauge.

It was furthermore decided that every one of these instruments must have been verified, and that where such verification was of old date, the instruments must be recompared with a standard of known error. This rule has been rigorously enforced with respect to thermometers, and rain gauges, but in a few cases where the error of the barometer was known to be very small, it has been thought better not to incur the liability to derangement consequent upon long railway journeys.

"II. *Time of Observation.*—It was resolved to accept no offers of observation unless the observers would undertake to record punctually at 9 a.m. and 9 p.m. local time.

"III. *Mounting of Instruments.*—After careful consideration, it was resolved that no pattern of thermometer-stand yet generally used was less objectionable than Stevenson's, and as it is also in very extensive use, your Committee resolved that its adoption by all your observers should be made a *sine quâ non.* The rain gauges are all placed with their rims one foot above the ground. The vacuum dull black-bulb thermometer made and mounted in accordance with the suggestions of the Rev. F. W. Stow, M.A., F.M.S., is alone accepted by your Committee as an indicator of Solar Radiation.

"IV. *Site of Observations.*—Your Committee have done their best in this matter, and they think that the Society has every reason to be satisfied with the positions which have been secured, with perhaps one exception. They have adopted a course new, they believe, to meteorology, but not the less desirable, viz. they have prepared ground plans drawn to a uniform scale of an inch to 20ft. of the environments of every station, showing the positions of the instruments and of all surrounding objects.

"V. *Locality of Stations.*—The organisation and inspection of the stations being still in progress, we can only report what is actually done. The stations in connection with this Society which will conform to all the above rules, which have been inspected by a member of your Committee, and respecting which detailed reports and plans are forwarded herewith, are as follows:—

STATION.	COUNTY.	ALTITUDE.	OBSERVER.
Dartmoor Prison	Devon	1374ft.	R. E. Power, Esq., L.R.C.P.
Bath	Somerset	145ft.	C. S. Barter, Esq., M.B.

* These Reports are deposited in the Office of the Society.

STATION.	COUNTY.	ALTITUDE.	OBSERVER.
*Brighton	Sussex	30ft.	R. P. B. Taaffe, Esq., M.D.
Crowborough Beacon Observatory	,,	828ft.	C. L. Prince, Esq., F.R.A.S.
Strathfield Turgiss	Hampshire	196ft.	Rev. C. H. Griffith.
Audley End	Essex	164ft.	Mr. J. Bryan.
The Heath House, Cheadle	Stafford	644ft.	J. C. Philips, Esq.
Buxton	Derby	1000ft.	E. J. Sykes, Esq.
Calcethorpe Manor, Louth	Lincoln	382ft.	D. G. Briggs, Esq.
Hestholme, Aysgarth	York, N. Riding	474ft.	Rev. F. W. Stow, M.A.

In addition to these we hold offers of returns from other districts, and these stations will be inspected and reported upon as soon as time permits—certainly before the close of the year.

"VI. It is only just to the observers to state that they have without a single exception entered most heartily upon the work, and recognising the supreme necessity of absolutely uniform procedure, have in every case subordinated their own wishes to the rules which your Committee have laid down.

"VII. *Expenditure.*—We are glad to say that although the distance travelled will be nearly, or quite, two thousand miles, and the time occupied one month, the entire cost of organising the system will probably be less than the £50 entrusted to us."

(Signed) HENRY STORKS EATON.
ROBERT H. SCOTT.
November 18*th*, 1874. G. J. SYMONS."

The Council feel that the best thanks of the Society are due to Mr. Symons for the time and trouble he has expended in inspecting the stations and in forwarding all matters connected with this work; and also to the other members of the Sub-committee, Mr. Eaton and Mr. Scott, for the assistance they have rendered in organising the necessary details.

A number of Fellows have taken the small Form, and will furnish observations to be deposited in the Library for reference in working at special investigations. Any Fellow can have copies of this Form if he will fill them up with observations and send them to the Library, subject to the approval of the Secretaries.

The Council have much pleasure in stating that an arrangement has been recently carried out for bringing this Society into more close connection with the Government, and eventually enlarging its sphere of usefulness. This matter was formally initiated by a letter which was received from the Director of the Meteorological Office on the 18th of November last, asking "whether, and on what terms, the Society would be prepared to furnish monthly observations from certain stations to be selected by that Office." The Council, which had had the matter for some time previously under its consideration, after much deliberation, at a special Meeting called for that purpose, agreed to

* Dr. Taaffe has since written to say that he cannot take two observations daily.

supply the information required by the Meteorological Office on the following conditions :—

(1) All original documents are to remain the property of the Society.

(2) Verified copies of the detailed observations on the Society's large Form to be supplied from five of the above stations in consideration of a minimum payment of £25 per annum, and any further number of stations agreed upon at £5 per annum per station.

(3) Verified copies of mean monthly values required for the Form referred to as B in Mr. Scott's letter of 18th November 1874, to be supplied from any number of the Society's stations, not exceeding twenty, at the rate of £2 10s. per annum per station.

(4) It is understood that the Society can obtain by application at H.M's. Stationery office, at the cost of press-work and paper, copies of any documents printed by the Meteorological Office.

(5) In all cases of publication of Tabular matter supplied by the Society, it is to be marked as having been furnished by the Society.

(6) This arrangement to be terminable at the close of any civil year, upon three months' previous notice being given by either party.

(7) All official communications relating to matters incident to this arrangement to be in writing.

(8) All communications from the Meteorological Office, regarding the observations contemplated in this arrangement, to be made through the Officers of the Society and not direct to the observers.

Some conversation having occurred at a Council Meeting respecting the observation of Natural Periodical Phenomena, the Form Committee took the matter into consideration, and recommended that observations of natural periodical phenomena should be entered on a separate Form, and suggested that application should be made to the Royal Agricultural, Royal Horticultural, Royal Botanic and other Societies, to nominate representatives to form a joint Committee, for the purpose of drafting complete instructions, and organising in an efficient manner this branch of investigation. The Council, recognising the importance of this subject, approved of the recommendation, and accordingly invited the co-operation of other societies interested in this matter. Meetings of this joint Committee have been held, when the subject has been fully discussed, and the following gentlemen have undertaken to prepare reports, viz.: Rev. T. A. Preston, M.A., on Plants; Mr. McLachlan, F.L.S., on Insects, and Prof. A. Newton, F.R.S., on Birds: so that we may expect some very useful and interesting facts connected with this subject to be furnished by them to the scientific public. An address from the President of this Society on the subject, and the communications from the above-named gentlemen, very efficiently express the aims and views of the Council in this matter.

The Council have much pleasure in stating that, by the change of the Printers and Publishers, announced in their last Report, they have been

enabled to print, at a reduced cost, considerably more matter in the Quarterly Journal, which they trust has thus been made even more interesting to the Fellows than hitherto. They have also thought it well to have abstracts of the discussions placed immediately after the Papers to which they refer, instead of their forming part of the Proceedings at the Meetings as previously.

The Papers that have been read before the Society during the past Session have been numerous and valuable; and the Council hope that the 'Quarterly Journal' will soon, from communications of this character, become a rich storehouse of information on all subjects connected with meteorology.

The following is the list of Papers which have been approved by the Council and read at the Meetings held during the year, viz.:—

February 18th.

"General Remarks on the West Indian Cyclones, particularly those from the 9th to the 21st September, 1872."
By F. H. Jahncke.

"New forms of Alcohol Thermometers."
By James J. Hicks, F.M.S.

"An improved Vacuum Solar Radiation Thermometer."
By James J. Hicks, F.M.S.

"Note on a Waterspout which burst on the Mountain of Ben Resipol, in Argyleshire, in August, 1873."
By Robert H. Scott, M.A., F.R.S.

March 18th.

"An attempt to establish a relation between the Velocity of the Wind and its Force (Beaufort Scale), with some Remarks on Anemometrical Observations in general."
By Robert H. Scott, M.A., F.R.S.

"On the Sensitiveness of Thermometers."
By G. J. Symons, F.M.S.

"On the Weather of Thirteen Autumns."
By R. Strachan, F.M.S.

April 15th.

"On the Climate of Patras, Greece."
By Rev. H. A. Boys.

"Remarks on the Atlantic Hurricane of August 20th to 24th, 1873."
By William R. Birt, F.R.A.S.

"On the Meteorology of December in the Southermost part of the South Indian Ocean."
By Robert H. Scott, M.A., F.R.S.

"On the Diurnal Variations of the Barometer."
By J. K. Laughton, M.A., F.R.A.S.

May 20th.

"Some Remarks on the Estimation of Wind Force, and on the Relation between Pressure and Velocity."
By C. O. F. Cator, M.A., F.M.S.

May 20th.

"On the Weather of Thirteen Winters."
By R. STRACHAN, F.M.S.

"On a New Deep Sea and Recording Thermometer."
By H. NEGRETTI, F.M.S., and J. W. ZAMBRA, F.M.S.

"On a New Mercurial Minimum and Maximum Thermometer."
By S. G. DENTON, F.M.S.

June 17th.

"On the connection between Colliery Explosions and Weather in 1872."
By R. H. SCOTT, F.R.S., and W. GALLOWAY.

"Solar Radiation, 1869-1874."
By Rev. FENWICK W. STOW, M.A., F.M.S.

"The diurnal inequalities of the Barometer and Thermometer as illustrated by the observations made at the summit and base of Mount Washington, U.S., during the month of May, 1872."
By W. W. RUNDELL, F.M.S.

"On the diurnal variation of the Barometer at Zi-Ka-Wei, and mean Atmospheric Pressure and Temperature at Shanghai."
By Rev. A. M. Colombel, M.A.

"Weather Report for 1873, at Woosung, China."
By CHARLES D. BRAYSHER.

"Notes regarding a remarkable and very severe hailstorm which occurred in the neighbourhood of Pietermaritzburg, the capital of the colony of Natal, on the 17th of April, 1874."
By Rev. J. DIGGES LA TOUCHE.

November 18th.

"Report concerning the Meeting of the Conference on Maritime Meteorology in London, August 31st, 1874."
By the PRESIDENT.

"On the Weather of Thirteen Springs."
By R. STRACHAN, F.M.S.

"Table for facilitating the determination of the Dew Point from observations of the Dry and Wet Bulb Thermometers."
By WILLIAM MARRIOTT.

"On the Heat and Damp which accompany Cyclones."
By the Hon. RALPH ABERCROMBY, F.M.S.

December 16th.

"Atmospheric Pressure and Rainfall."
By J. C. BLOXAM, F.M.S.

"Remarks on West India Cyclones."
By F. H. JAHNCKE.

"Notes on the Weather experienced over the British Isles and the North West of France during the first few days of October, 1874."
By R. H. SCOTT, F.R.S.

"On a New Self-Registering Hygrometer."
By H. NEGRETTI, F.M.S., and J. W. ZAMBRA, F.M.S.

December 16th.

"Results of Meteorological Observations made at, and near, St. Paul's Island, in the South Indian Ocean."

By R. H. Scott, F.R.S.

"Description of a new patent portable Magnetic Anemometer and Current Meter for maritime use."

By R. M. Lowne.

There were also several new meteorological instruments exhibited at the Meetings, many of which possess great merit. The list is as follows:—

New Forms of Alcohol Thermometers.

By James J. Hicks, F.M.S.

An Improved Vacuum Solar Radiation Thermometer.

By James J. Hicks, F.M.S.

A New Deep Sea and Recording Thermometer.

By H. Negretti, F.M.S., and J. W. Zambra, F.M.S.

A New Mercurial Minimum and Maximum Thermometer.

By S. G. Denton, F.M.S.

A new Self-Registering Hygrometer.

By H. Negretti, F.M.S., and J. W. Zambra, F.M.S.

And A new patent portable Magnetic Anemometer and Current Meter for maritime use.

By R. M. Lowne.

The Council have carefully considered how they might invest the Funds of the Society to the best advantage, and have accordingly purchased £800 Guaranteed Stock 4½ per cent. in the Manchester, Sheffield and Lincolnshire Railway, with the proceeds of the sale of £953 11s. 3d. New 3 per Cents. By this purchase they have obtained a larger dividend and so increased the income of the Society. Subsequently, in order to defray the expenses incurred in the organisation and inspection of the Society's new observing stations, £50 of New Three per Cents. was sold out, but there still remains in that Stock a sum of £200 available as a floating balance.

In Appendix I. will be found an abstract of Receipts and Expenditure for the year ending December 31st, 1874, by which it will be seen that the total amount of the receipt account is £495 4s. 2d., and of the expenditure account is £478 10s. 6d., leaving a balance in favour of the Society amounting to £16 18s. 8d. This, however, does not show the precise receipts and expenditure for the year, as the sum of £50 stock sold out was carried to the receipt account. As this expenditure was incurred for the permanent benefit of the Society, and will not occur again, it should be eliminated from the accounts, if we wish to obtain a fair opinion of our financial progress. There are, also, other items of unusual outlay, viz. lithographing and printing the Diploma, and printing the Bye-laws, so that we may fairly consider the receipts to have exceeded the expenditure by more than £30.

The Council have much pleasure in announcing an increase in the number

of Fellows, which is very satisfactory when we consider that eleven have retired through arrears being closely collected, and ten have been removed from the list in consequence of the non-payment of subscriptions. The following tabular statement shows the present number of Fellows, and the changes which have occurred during the year :—

	Fellows.			Totals.
	Life.	Ordinary.	Honorary.	
1873, December 31 ...	77	224	7	308
Since elected	+ 1	+ 30	+ 12	+ 43
Since compounded......	+ 2	— 2	...	0
Deceased	— 1	— 1	— 1	— 3
Retired	...	— 11	...	— 11
Defaulters	...	— 10	...	— 10
Deceased previous to December 1873 ...	...	...	— 1	— 1
Incorrectly reported as deceased	+ 1	...	...	+ 1
1874, December 31......	80	230	17	327

The Society has to deplore the loss by death of two of its Fellows and one of its Honorary Members, viz. :—

Henry Deane, F.L.S., elected into the Society, November 18th, 1863.
Charles Mends Gibson, F.R.C.S., April 18th, 1866.
Lambert Adolphe Jacques Quetelet, May 27th, 1851.

Henry Deane, F.L.S., was born at Stratford, in the parish of West Ham, Essex, on the 11th of August, 1807. For nearly the first eleven years the only sound instruction he received was from his parents ; he was then sent to school, but unfortunately his father's means were not such as to enable him to keep him long at school, so he was removed before he was fourteen years old. His father's business not being suited to his taste nor his physical constitution, he was, at the age of eighteen, apprenticed for three years to Mr. Joseph Fardon, a chemist and druggist at Reading. He applied himself earnestly to work, and to acquire such a knowledge of pharmacy as he was able. After he was out of his time at Reading, he succeeded in obtaining a situation at John Bell and Co's., in Oxford-street, where he remained altogether for about five years. In the autumn of 1837, with the assistance of several friends, he entered upon business for himself at Clapham, where being favoured with liberal support, he was very successful.

On the establishment of the Pharmaceutical Society in 1841, he became one of its members, but took no active part in its formation. In 1844 he was requested to become one of the Board of Examiners, to which after a little

hesitation he consented; a step which he never regretted, as it afforded him large means of self-improvement, and brought him into contact with men whose friendship he esteemed very highly.

He joined the Microscopical Society on its formation in 1840; and in 1845 made the remarkable discovery of the existence of the Xanthidia and Polythalamia in the Grey Chalk of Folkestone, a bed below the common White Chalk.

He was elected on the Council of the Pharmaceutical Society in June 1851, and almost directly after was proposed as Vice-President. He held the office of President during the years 1853 and 1854.

He died suddenly at Dover on Saturday, April 4th, 1874, of heart disease, while on a journey to visit his eldest son at Pesth.

He was elected a Fellow of the Society on November 18th, 1863.

Charles Mends Gibson, F.R.C.S., was born at Plymouth, April 23rd, 1809. He studied his profession at St. Bartholomew's Hospital; and subsequently became one of the leading medical men in Norwich, where he attained considerable eminence, especially as a lithotomist, being peculiarly skilful and successful in surgical operations of a delicate nature. He maintained in that city a small cottage hospital at his own expense. He was for many years the Medical Superintendent of the Bethel Hospital for Lunatics at Norwich; was a director and senior vice-president of the Norwich Union Life Assurance Society, and held various other appointments, all of which, however, failing health compelled him to resign.

His leisure time was devoted to the pursuit of science, in which he always took a keen interest; it was mainly owing to his exertions that the Norwich Meteorological Society was founded in 1868, and that an anemometer and various other meteorological instruments were erected at Norwich. Although unable during the last year or two of his life to take any active part in the management of that Society, he always evinced much interest in its welfare, and held the office of honorary secretary until his death. Mr. Gibson took a warm interest in the Norwich Museum, the Microscopical, and other local Societies for the advancement of science; the study of Botany was a favourite pursuit, and he had a choice collection of plants carefully arranged by himself. He was a great reader, and possessing an active, clear, and cultivated mind, which, combined with a winning and courteous manner, made his society attractive to all with whom he came in contact His consistent Christian life and disinterested consideration for others, especially endeared him to his intimate friends.

His failing health rendered it necessary for him to seek a southern climate during the last three years of his life, by which means it was hoped his valuable life would have been prolonged; but a sudden and unexpected hemorrhage terminated his life at Amélie les Bains, Pyrenées Orientales, on January 12th, 1874, in his 65th year. His remains were brought to England, and interred at Scotton in Norfolk.

Mr. Gibson was elected a Fellow of this Society, April 18th, 1866, and was a member of the Council in 1870.

APPEN-

Abstract of Receipts and Expenditure

Receipts.

1874.		£ s. d.	£ s. d.
Jan. 1.	Balance from last year	....	85 9 10
April	Dividend on £1100 New 3 per Cents	16 5 11	
June	Do. £800 M. S. & L. R. 4½ Debenture Stock	17 16 3	
Oct.	Do. £250 New 3 per Cents	8 14 5	
Dec.	Do. £800 M. S. & L. R. 4½ Debenture Stock	17 17 0	
			55 13 7
Dec. 31.	Subscriptions for 1869	1 0 0	
	Do. for 1870	2 0 0	
	Do. for 1871	2 0 0	
	Do. for 1872	12 3 0	
	Do. for 1873	34 3 0	
	Do. for 1874	186 11 0	
	Do. for 1875	3 0 0	
	Entrance Fees	30 2 0	
	2 Life Composition Fees	22 0 0	
			292 19 0
Dec. 31.	Sale of Publications. By Assistant Secretary	13 16 3	
	Do. By Williams and Strahan	1 13 0	
			15 9 3
Mar. 26.	Sale of £953 11s. 3d. New 3 per Cents	859 8 0	
Dec. 24.	Do. £50 do.	45 12 6	
			905 0 6
			£1354 12 2

DIX I.

for the Year ending December 31st, 1874.

Expenditure.

1874.	£ s. d.	£ s. d.
Journal—		
Printing, Nos. 9—12	81 3 6	
Illustrations	8 4 6	
Authors' Copies	8 8 0	
Registrar-General's Reports	6 4 0	
		104 0 0
General Printing, Stationery, &c.—		
Circulars, &c.	16 9 0	
Stationery	7 18 10	
Bye-Laws	9 19 0	
Diplomas	10 0 0	
Cases for 'Proceedings' and 'Journal,' and binding	2 8 3	
		46 15 1
Salaries—		
Assistant Secretary	100 0 0	
Bankers' Clerks, Christmas	2 2 0	
		102 2 0
Office Expenses, &c.		
Rent and Housekeeper	28 8 6	
Furniture	7 17 5	
Postage and Receipt Stamps	22 16 9	
Parcels and Petty Expenses	2 17 8	
Refreshments at Meetings	9 12 6	
		71 12 10
Observations—		
Vote for organising stations	50 0 0	
Printing Forms and Reports on Natural Periodical Phenomena	9 11 6	
		59 11 6
Stock—		
March 26. Purchase of £800 M. S. and L. R. 4½ Debenture Stock	859 8 0	
April 14. Do. £53 11s. 3d. New 3 per Cents.	48 14 10	
„ 21. Do. £50 do.	45 13 9	
		953 16 7
Banker's Commission on Irish Cheque		0 0 6
		1337 18 6
Balance in hands of Messrs. Martin & Co., December 31st, 1874	12 14 8	
Balance in hands of Assistant Secretary	3 19 0	
		16 13 8
		£1354 12 2

HENRY PERIGAL, *Treasurer.*

Examined with the Vouchers, and found correct, 13th January, 1875.

E. G. ALDRIDGE, J. S. HARDING, } *Auditors.*

APPENDIX I.—*Continued.*

Abstract of Liabilities and Assets for the year ending December 31st, 1874.

Liabilities.

	£ s. d.
o Sundry Creditors	4 0 0
, Excess* of Assets over Liabilities	1169 18 8
	£1173 18 8

Assets.

	£ s. d.	£ s. d.
By Society's Money invested in New 3 per Cents., £200 at 92⅜	184 15 0	
,, Society's Money invested in M. S. and L. R. 4½ Debenture Stock, £800 at 109	872 0 0	
,, Subscriptions of the year uncollected	46 0 0	
,, Do. former years unpaid	15 10 0	
,, Entrance Fees unpaid	4 0 0	
,, Furniture, Fittings, &c.	20 0 0	
,, Instruments	15 0 0	
		1157 5 0
,, Cash in hands of Messrs. Martin & Co., December 31st, 1874	12 14 8	
,, Do. in hands of Assistant Secretary	3 19 0	
		16 13 8
		£1173 18 8

E. G. ALDRIDGE, } *Auditors.*
J. S. HARDING, }

* This excess is exclusive of the Value of the Library and Stock of Publications.

Lambert Adolphe Jacques Quetelet has been taken from among us at the ripe age of nearly fourscore years, and he has left a gap in the ranks of first-class meteorologists which it will be hard to fill. In fact, we may say that he and Dove have by themselves done more to bring meteorology within the circle of the exact sciences than any physicists of the present century, while the scientific treatment of the subject can hardly be considered to date from a much earlier period.

Quetelet was born on the 22nd February, 1796, at Ghent, and his first public success was a drawing prize at the Lyceum of his native town, gained at the age of 16, but in awarding it M. Cornelissen stated that the recipient of the prize had won honours in all branches of his studies. At the age of 18 he was appointed Mathematical Professor at the college of Ghent, where he remained about five years. In 1819 he took his Doctor's degree, and in October of the same year he moved to Brussels as Professor of Mathematics at the Athénée. In 1828 he was appointed to the chair of Astronomy in connection with the newly-established Observatory of that city, and he died in that post after forty-six years of almost unremitting work.

This is not the place to advert to the results of his many-sided genius in more fields than our own, but of the 220 papers which are appended to his name in the Royal Society catalogue, no less than 82 are meteorological, exclusive of those referring to meteorites or terrestrial magnetism. He will mainly be known among us for his great works 'Sur la Météorologie de Belgique,' and 'La Météorologie de Belgique comparée à celle du globe,' and by his having been unanimously elected President of the well-known Brussels Conference in 1853.

In the works above mentioned, of which the former seems to have been strangely ignored in some of the numerous notices of their author which have appeared, will be found the most exhaustive discussion of the meteorology of any individual district which has ever been published, and they furnish a model for all inquiries of a similar nature.

Quetelet died on the 17th February, 1874, a victim to bronchitis, only five days before he would have completed his 78th year.

APPENDIX II.

THE METEOROLOGICAL OFFICE. Robert H. Scott, M.A., F.R.S., Director.—*Marine Meteorology.* In this department the Monthly Charts for Square 3, the ten-degree square embracing the district of the Atlantic Doldrums, have been published, with a volume of explanatory Remarks.

This work has occupied the attention of the Marine Branch of the Office for the space of six years, and it may fairly be described as the most complete account that has ever been given of the meteorology of any part of the sea. In an Appendix, a selection of the best quality logs has been specially treated, and from them the four-hourly means of pressure and of air and sea temperature have been determined for each month and for the northern and southern halves of the Square. From these means have been calculated the constants in the periodical expression for the diurnal variations of the elements in question. The efforts of the staff are now directed to the treatment of the materials available for the investigation of the entire district bounded by the parallels of 20° N and 10° S, and by the meridians of 10° W and 40° W, forming nine ten-degree squares of which Square 3 forms the centre.

It must be remembered that the material available for Square 3 amounts to 59 per cent. of the entire information in the Office for the district of the Atlantic from 20° N to 10° S, so that it is obvious that the larger area will not bear nearly so minute a discussion as has been effected for the work already published.

It is hoped that the Charts and Remarks for the entire district will appear in the course of the year 1875.

Of minor investigations may be noticed the discussion of the information relating to Kerguelen and St. Paul's Islands, in the month of December, which was carried out for the use of our own and the French Expeditions for the observation of the Transit of Venus.

The Office has undertaken the discussion of the great storm which swept over the Western Atlantic and the coast of Nova Scotia, August 23-25, 1873, and is collecting all the information obtainable for the Atlantic for the entire month of August. The results of the discussion will be published in a series of Charts like those which have already appeared for the 'City of Boston' gale of February 1870.

The most important matter connected with this branch of the Office, and indeed with the subject of Ocean Meteorology in general, has been the assemblage in the month of August at the Office, of a private Conference to discuss the results and operation of the Brussels Conference for Maritime Meteorology, held in 1853, from which meeting the Meteorological Department of the Board of Trade may be said to have taken its rise. The late Conference was attended by 25 Members, belonging to every maritime country of importance in Europe except Sweden and Turkey. India and China were also represented.

The sittings lasted for three days, and the Report of the Proceedings is in the press. It is interesting to note that the resolutions, on the whole, were confirmatory of those adopted 20 years ago at Brussels, and we may hope that a further impulse may have been given by this meeting to the prosecution of Ocean Meteorology in countries which possess navies, but have hitherto taken but little part in the work.

Weather Telegraphy.—The only important change in this department during the year has been the return to a system of signals very similar to that introduced originally by Admiral FitzRoy.

By the new system a cone is employed to indicate the direction of the wind to be apprehended. The cone, point downwards, indicates southerly gales (SE, by S, to NW). The cone, point upwards, indicates northerly gales (NW, by N, to SE).

The drum is used to emphasise the cone, and to indicate danger of a very heavy gale from the point indicated by the cone.

It is also attempted to assign a degree of probability for the storm indicated by the signal by announcing that hitherto *three* out of *five* signals of storms and *four* out of *five* signals of strong winds have been found to be fully justified.

The Parliamentary Return of the correctness of the warnings for the year 1873, gives a total percentage of success of nearly 80.

The Office has undertaken to co-operate with the Signal Office of the United States in the proposed interchange of synchronous Reports taken at 0·43 p.m. Greenwich time.

Upwards of sixty volunteer observers have come forward to take part in the work for the British Isles alone.

It may be allowed to anticipate the appearance of the forthcoming Report of the Permanent Committee appointed by the Vienna Congress, and to state that it has been resolved to propose the general adoption of an international code for meteorological telegraphy, which will only be varied to a slight extent to meet the requirements of the necessary recognition of the British and Continental scales for instrumental readings.

Land Meteorology of the British Islands.—The publication of the 'Quarterly Weather Reports' has been carried on up to September 1873.

The issue of lithographic copies of the hourly values of the tabulations of the self-recording instruments will be continued for 1875, and the values of vapour tension will be added to the information given in the sheets first issued. A copy of these monthly sheets has been furnished to the Society's library.

The deliberations of the Permanent Committee have resulted in a most important measure as regards the future of British meteorology. It has been resolved to request each nation to publish *actual readings*, taken at uniform hours, for a limited number of stations, as well as monthly means of the usual character from certain additional stations.

It is unnecessary here to recapitulate the terms of the agreement, which have been so cordially accepted by the Society.

The stations with which the publication of the actual readings will commence for January 1st, 1875, as at present arranged, are

Stations in connection with the Meteorological Office.

Sumburgh Head, Shetland.
Markree, County Sligo.
Parsonstown, King's County.
Oscott, Warwickshire.
Chatham, Kent.

Stations obtained from the Meteorological Society.

Aysgarth, Yorkshire.
Calcethorpe, Lincolnshire.
Buxton, Derbyshire.
Carmarthen, Carmarthenshire.
Dartmoor, Devonshire.
Strathfield Turgiss, Hants.

It is hoped that further additions will be made to this list.

The list of extra stations from which mean results only will be published has not yet been fixed.

The Office is commencing this publication on the form selected, for the years 1873-4, for such stations, included in the above list, for which observations of sufficiently high character are in existence.

It is hoped that the above measure will tend to wipe off the blot which has rested on this country, owing to the deficiency of publication of results, when contrasted with the labour spent by unpaid observers in the comparatively thankless duty of recording meteorological observations.

SCOTTISH METEOROLOGICAL SOCIETY.—1. The Society has continued the prosecution of the inquiry into the relation existing between the herring fishery and sea temperature, winds and weather generally, which was undertaken in 1872, on the suggestion of the Marquis of Tweeddale, President of the Society. A second Report has been printed in the Society's Journal, Vol. IV. p. 134. At the General Meeting of the Society in July last, the Marquis of Tweeddale generously presented the Society with twenty sea-thermometers for the observation of sea temperature by the fishermen.

These thermometers were placed in the hands of an intelligent fisherman in each of the fishing districts by the Scottish Fishery Board, who have cordially

co-operated with the Society in this inquiry, together with special meteorological fishery schedules prepared by the two bodies.

It must be added that the Commissioners of Northern Lighthouses have given very material assistance in this inquiry, by the valuable observations the keepers of the lighthouses have made for the Society since 1867. The position of the lighthouses, and what may be called the continuousness of the observation of the more marked phenomena of the weather rendered practicable by the occupation of the observers, give great value to the observations.

The observations of last year's fishings are now in course of being discussed.

2. On the suggestion of Mr. Stevenson, the Honorary Secretary, a number of STORM STATIONS have been, and others are in the course of being established, in lines radiating from Edinburgh, at which observations, chiefly barometric and wind, are made, with the view of collecting data for the solution of such questions as the relation of wind-force to the barometric gradient; the influence of the sea on climate, particularly its extension inland; and generally those influences which determine local climates.

3. The influence of seasons on human mortality has been inquired into by Dr. Arthur Mitchell, Chairman of the Medico-Climatological Committee, and Mr. Buchan, Secretary, nine months of whose time, officially set apart for original investigations, has been devoted to it. The results were made public at the General Meeting in July, and will be published immediately.

4. The Secretary has also begun to discuss the observations made by the Society's observers during the past 19 years in connection with the relation of meteorology to agriculture, horticulture, arboriculture, and natural history, a first paper on which will soon be published.

ROYAL OBSERVATORY, GREENWICH. Sir G. B. Airy, K.C.B., F.R.S., Astronomer Royal.—No changes, either in the instruments or methods of reduction, have been made during the course of the year.

The reduction of the photographic records of the thermometers from 1848 to 1868, which has been for some time in hand, is now complete. The diurnal changes of the thermometers (dry and wet bulb) have been investigated as depending on the month, on the temperature waves, on the barometric waves, on the overcast and cloudless states of the sky, and on the direction of the wind. The reduction of the photographic records of the barometer from 1854 to 1873 has been commenced, and some progress made in the work. A collection of the observations of the deep-sunk thermometers from 1846 to 1873 has also been made.

Meteorological observations are now taken daily at 0h. 45m. p.m. for transmission through the Meteorological Office to General Myer, Chief Signal Officer, War Department, United States of America.

ROYAL OBSERVATORY, EDINBURGH. Professor C. Piazzi Smyth, F.R.A.S., Astronomer Royal for Scotland.—The Royal Observatory, Edinburgh, has been much crippled during the past year, by having been deprived of one of its two Assistants during nearly half the time. The computation of the Meteorological observations at 55 stations of the Meteorological Society of Scotland has nevertheless been kept up, and the results have been printed in the Monthly and Quarterly Returns of the Registrar General for Scotland. The whole *in-put* of Government Funds into the Observatory to produce the above *out-put* of computations in Meteorology was, for the year, £106.

KEW OBSERVATORY. Samuel Jeffery, Superintendent.—The several automatic arrangements for recording respectively the barometer, the dry and wet bulb thermometers, the anemometer, and the rain-gauge, have been maintained in constant action, and the daily standard eye-observations for control of the photographic records have been made regularly.

The instrumental traces with hourly tabulated values are sent monthly to the Meteorological Office as in former years. The barograms and thermograms are

obtained in duplicate, and one copy is preserved at Kew. As regards the anemograms and hyetograms, the copy is obtained by the method of tracing.

In addition to the regular work of Kew as one of the self-recording Observatories in connection with the Meteorological Office, the duty of examining and checking the work of all the seven Observatories of the same character has been carried on, in accordance with the method described in the Report of the British Association for 1869.

A series of investigations have been conducted with the view of testing the degree of accuracy attainable in the tabulation of the thermograms by the process described in the British Association Report just referred to. It has been found to be an improvement to set the glass tabulating-scale by means of fiducial lines traced on the thermograms by photographic means, in preference to setting it, as heretofore, by standard readings. The great advantage derived from the new method is the discovery of "bagging" whenever it exists in the curves.

The Self-recording Electrometer, which had been taken to Glasgow for alteration, was returned in February, and was adjusted for action on March 10. It has since continued in satisfactory working order.

The daily record of temperature from thermometers at different elevations on the Pagoda in the Royal Gardens, Kew, at the expense of the Meteorological Committee, was continued up to August, when it was interrupted, to be resumed during the winter months.

The verification department has exhibited increased activity, especially as regards the verification of thermometers and the construction of standard thermometers. The meteorological instruments which have been verified are as follows:—

Barometers, Standards	110
„ Marine and Station	40
	150
Aneroids	10
Thermometers, ordinary Meteorological	1471
„ Boiling-point Standards	22
„ Mountain	32
„ Clinical	1255
	2780

In addition, thirty-six thermometers have been tested at the freezing-point of mercury, and one metallic thermometer has been tested.

Eighteen Kew Standard Thermometers have been calibrated and divided at Kew.

The following miscellaneous instruments have also been verified:—

Rain-gauges	13
Robinson's Dial Anemometers	14
Telescope	1
Sextant	1
Theodolite	1
Hydrometers	66

A barograph and thermograph have been verified for Mr. Kingston for the Observatory at Toronto, and the values of the Scales have been determined as far as practicable.

Experiments have been made with a view to the construction of an apparatus devised by Mr. F. Galton, F.R.S., for facilitating the verification of thermometers, and also for rendering it possible to extend the range to which the Kew verifications at present apply.

A large stock of filled thermometer-tubes for the construction of Standards has been laid in, and the tubes have been annealed.

In the last Report mention was made of certain experiments in progress with respect to the testing of anemometers, a piece of ground having been rented in the Park for erecting the instruments.

The experience of a few months was sufficient to show that the exposure in the Park was not nearly sufficiently open to afford facilities for testing the instru-

ments at any but very low velocities, and not very satisfactorily even in such cases. Application was therefore made to the Secretary of the Crystal Palace Company for permission to employ a rotary machine driven by steam-power, so as to be able to vary the velocities at pleasure.

Consent having been most freely given, the experiments were commenced, and the instruments tested at various velocities up to about 30 miles an hour, the highest attainable by the apparatus. The investigations were interrupted during the summer, and will be resumed on a future occasion. It is hoped that by this method of artificial rotation, which was that employed by Smeaton in his experiments on windmill sails, more satisfactory results will be attained than it is otherwise possible to get. The expense of these experiments has been defrayed by a vote of the Government-Grant Fund of the Royal Society.

RADCLIFFE OBSERVATORY, OXFORD. Rev. R. Main, M.A., F.R.S., Radcliffe Observer.—Very few changes of any importance in the system of meteorological observations carried on at this Observatory, have occurred since the date of the last Report. It was then stated that it was intended to place a thermometer on the elevated terrace beneath the tower on its north side, at a height of about 55 feet above the ground. This has been done, and daily readings of it have been taken during the past year.

In addition, it is to be mentioned that, at the request of the Meteorological Office, daily observations are made at 0h. 45m. Oxford Time, in connection with the series of simultaneous observations proposed by General Myer, U.S.A., which is intended to be carried out over the whole Northern Hemisphere.

CAMBRIDGE OBSERVATORY. Professor J. C. Adams, M.A., F.R.S.—The only alteration made in the meteorological work at this Observatory during the past year, has been the adopting 8 a.m. and 6 p.m. as the time for taking the observations for reduction. The readings made at these hours have been forwarded to the Meteorological Office, London, and likewise those taken at 0h. 45m. p.m. G.M.T. for the American Government.

The instruments have all worked satisfactorily during the year.

MOORSIDE OBSERVATORY, HALIFAX. Louis J. Crossley, F.M.S.—The meteorological work at this Observatory continues as heretofore. The self-recording instruments are in continuous operation, and eye observations are made four times daily.

A new ozone box, on Dr. Moffatt's plan, has been in use since March 11th, in place of the copper gauze cage, which had become worthless.

King's barograph was removed on April 23rd from the Observatory to the ground-floor of the house. It continues to work satisfactorily.

The pressure-anemometer, which had for some time previously been found to work very stiffly, was taken down on September 26th; after having been examined, cleaned and oiled, it was re-started on October 8th.

REPORT OF THE CONFERENCE ON THE REGISTRATION OF NATURAL PERIODICAL PHENOMENA.

[Read at the Ordinary Meeting, February 17th, 1875.]

WHEN preparing the Forms for recording Meteorological Observations, the Form Committee considered the question of the registration of Natural Periodical Phenomena, and reported to the Council as follows:—"In conclusion, the Committee recommend that Natural Periodical Phenomena,

especially as bearing upon the influence of the Seasons on the state of Agriculture, be entered on a separate form. They therefore suggest that application be made to the Royal Agricultural, Horticultural, and Botanic Societies, to nominate representatives to serve on a joint Committee, for the purpose of drafting complete instructions, and organising in an efficient manner this branch of investigation, and taking observations of earth temperature, &c."

The Council, recognising the importance of the subject, adopted this recommendation, and forthwith issued the following letter:—

"OBSERVATIONS OF NATURAL PHENOMENA.

"THE METEOROLOGICAL SOCIETY,
30 Great George Street,
Westminster, S.W.,
March, 1874.

"Sir,—The Council of the above Society have resolved that it is expedient that Observations of Natural Phenomena connected with the return of the seasons, as well as of such branches of physical inquiry as tend to establish a connection between meteorological agencies and the development of vegetable life (such as the temperature, &c., of various soils) should be organised on a more systematic and scientific basis than heretofore.

"They are of opinion that this could be best done by a joint Committee of representative Members of those Societies before which such subjects most naturally come; and they have, therefore, decided upon inviting the co-operation of your Society by the nomination of one or more delegates to join a Committee by whom the whole question as bearing upon Agriculture, Horticulture, &c., should be considered, and to whom, also, any written communications could be submitted.

"The Council trust that your Society may be represented by delegates; but if that course is impossible, they invite any written suggestions which you may have to offer.

"A meeting of the delegates will be called for an early date, after the receipt, from the Societies consulted, of the names of the gentlemen nominated by each.

"We are, Sir,
"Your obedient Servants,
"G. J. SYMONS,
"JOHN W. TRIPE,
"*Hon. Secretaries.*"

The following is the List of the Societies which nominated representatives, with the names of the gentlemen elected:—

Royal Agricultural	Mr. W. Carruthers, F.R.S.
	Mr. C. Whitehead, F.L.S.
Royal Horticultural	Prof. W. T. Thistelton Dyer, F.L.S.
	Mr. R. McLachlan, F.L.S.
Royal Botanic	Prof. R. Bentley.
	Mr. G. J. Symons.
	Mr. W. Sowerby, F.L.S.
Royal Dublin	Dr. G. J. Allman, F.R.S.
Marlborough College Natural History	Rev. T. A. Preston, M.A.
Meteorological	Dr. R. J. Mann, F.R.A.S.
	Rev. C. H. Griffith.
	Mr. H. S. Eaton, M.A.
	Mr. R. H. Scott, F.R.S.

Replies were also received from the Royal Society, Bath and West of England Society, and the Highland Society, to the effect that they fully recognised the importance of the subject; but that they were either indisposed to act in their corporate capacity, or did nct possess the organisation necessary to enable them to co-operate with the Society.

The first meeting of the Conference was held at the Office of the Society, 30 Great George Street, on Thursday, July 2nd, of which the following is a copy of the Minutes:—

"Present—Dr. Mann, Rev. T. A. Preston, Messrs. Carruthers, Eaton, Scott and Symons.

"On the motion of Mr. Carruthers, Dr. Mann was requested to take the Chair.

"Mr. Symons explained the objects for which the Conference had been called.

"After some discussion, it was resolved—'That the Rev. T. A. Preston be requested to prepare a List of Plants proposed to be observed, with a Report and Notes.'

"It was also resolved to request Prof. A. Newton to supply a List of Birds; Mr. R. McLachlan a List of Insects; and Prof. T. Bell a List of Mammals and Reptiles, suitable for observing in connection with the return of the Seasons, with suggestions.

"(Signed) GEO. J. ALLMAN."

The Reports prepared in accordance with the above Resolutions are as follows:—

Report prepared by the REV. T. A. PRESTON, M.A., *at the request of the Conference on the Registration of Natural Periodical Phenomena.*

IN drawing up the accompanying table, attention has been paid to the following considerations:—

(1) Distribution over England and Scotland. Mr. Watson's "Topographical Botany," only very recently issued, has been of great help. Of the 112 counties into which the country is divided, no plant occurs in more than 103 of them. Of course, as many species as possible have been taken from those which occur in the greatest number of counties, and but very few, and then only from other considerations, have been taken from species occurring in less than 90 counties.

(2) Average date of flowering. In order to prevent having too many species under observation at once, and also to have some species always under observation, the species occurring about Marlborough have been taken as a guide, as the dates of first flowering for the last ten years have in most cases been recorded. These dates will naturally vary for other localities, and hence it will be necessary for observers to take this into consideration. In order to render this list as useful as possible, the earliest and latest dates of first flowering during the ten years have been added, in order to give the utmost limits during which any particular species may generally be looked for.

(3) The amplitude of flowering, *i.e.* the difference between the dates of first flowering of the same plant in different years. Where this has been very great, the plant has been discarded, unless other considerations render it advisable to be retained in the list. It may be observed that the amplitude is greatest in those plants which flower early in the year; and as but very few plants are fit for observations in periodic flowering at that time, some have been retained which would otherwise have been discarded.

(4) Distribution over the whole range of plants, so as to have as many natural orders as possible represented in the list. In this way, many plants, which would otherwise have been very useful for observation, have been omitted from the list, as it would have otherwise caused some important orders to be excluded. The order *umbelliferæ* has been very poorly represented; and to get even the few that are put in the list, other apparently more important species had to be omitted.

(5) Species not generally cultivated. Cultivated specimens are, as a rule, bad for observations in the case under consideration. The necessity of interfering with the ground, either for weeding or manuring, or even for the sake of tidiness, alter the conditions in which the plant grows. Very frequently, too, plants under cultivation flower much earlier than wild ones.

(6) Species whose *habitats* are not variable: some species, which might otherwise have been selected, grow in such different situations, that they are quite past flowering in some localities, and only just coming into flower in others.

(7) Species whose *time of flowering* is definite, *i.e.* of which extra early specimens are not generally found. This has been the cause of the omission of several species, as for instance of *Heracleum Sphondylium*, as solitary specimens are often in flower weeks before the species may properly be said to "begin flowering."

(8) Critical species. The most distinct and conspicuous plants have been

selected; though for the sake of non-botanists, it has been deemed advisable to give certain remarks upon some of the species, distinct enough in themselves, but frequently confounded with other allied ones. In the preparation of this first list, it has been thought best to omit *Rushes*, *Sedges* and *Grasses*.

LIST OF PLANTS SUGGESTED FOR OBSERVATION.

1 ANEMONE NEMOROSA (Wood Anemone).
2 RANUNCULUS FICARIA (Pilewort—Lesser Celandine).
3 ,, *acris* (Upright Crowfoot).
4 CALTHA PALUSTRIS (Marsh Marigold).
5 *Papaver Rhœas* (Red Poppy).
6 *Cardamine hirsuta* (Hairy Bitter Cress).
7 ,, *pratensis* (Cuckoo-flower—Lady's Smock).
8 *Draba verna* (Whitlow Grass).
9 *Viola odorata* (Sweet Violet).
10 *Polygala vulgaris* (Milkwort).
11 *Lychnis Flos-cuculi* (Ragged Robin).
12 *Stellaria Holostea* (Greater Stitchwort).
13 MALVA SYLVESTRIS (Common Mallow).
14 *Hypericum tetrapterum* (Square St. John's Wort).
15 ,, *pulchrum* (Upright St. John's Wort).
16 GERANIUM ROBERTIANUM (Herb Robert).
17 TRIFOLIUM REPENS (Dutch Clover).
18 *Lotus corniculatus* (Bird's Foot Trefoil).
19 *Vicia Cracca* (Tufted Vetch).
20 ,, *sepium* (Bush Vetch).
21 *Lathyrus pratensis* (Meadow Vetchling).
22 PRUNUS SPINOSA (Sloe—Black-thorn).
23 *Spiræa Ulmaria* (Meadow-sweet).
24 *Potentilla anserina* (Silver-weed).
25 ,, *Fragariastrum* (Barren Strawberry).
26 *Rosa canina* (Dog Rose).
27 *Epilobium hirsutum* (Great Hairy Willow-herb).
28 ,, *montanum* (Broad Willow-herb).
29 *Angelica sylvestris* (Wild Angelica).
30 *Anthriscus* ,, (Cow Chervil).
31 HEDERA HELIX (Ivy).
32 *Galium Aparine* (Cleavers).
33 ,, *verum* (Yellow Bedstraw).
34 *Dipsacus sylvestris* (Teasel).
35 *Scabiosa succisa* (Devil's-bit).
36 *Petasites vulgaris* (Butter-bur).
37 TUSSILAGO FARFARA (Coltsfoot).
38 ACHILLEA MILLEFOLIUM (Milfoil; Yarrow).
39 *Chrysanthemum Leucanthemum* (Ox-eye).

LIST OF PLANTS SUGGESTED FOR OBSERVATION—*continued.*

40 *Artemisia vulgaris* (Mugwort).
41 *Senecio Jacobæa* (Ragwort).
42 CENTAUREA NIGRA (Black Knap-weed).
43 *Carduus lanceolatus* (Spear Thistle).
44 ,, *arvensis* (Field Thistle).
45 *Sonchus arvensis* (Corn Sow-thistle).
46 *Hieracium Pilosella* (Mouse-ear Hawkweed).
47 CAMPANULA ROTUNDIFOLIA (Hair-bell).
48 *Gentiana campestris* (Field Gentian).
49 CONVOLVULUS SEPIUM (Greater Bindweed).
50 *Symphytum officinale* (Comfrey).
51 *Pedicularis sylvatica* (Red Rattle).
52 *Veronica Chamædrys* (Germander Speedwell).
53 ,, *hederifolia* (Ivy-leaved Speedwell).
54 *Mentha aquatica* (Water Mint).
55 *Thymus Serpyllum* (Wild Thyme).
56 *Prunella vulgaris* (Self-heal).
57 *Nepeta Glechoma* (Ground Ivy).
58 *Galeopsis Tetrahit* (Hemp-nettle).
59 *Stachys sylvatica* (Hedge Woundwort).
60 *Ajuga reptans* (Bugle).
61 PRIMULA VERIS (Cowslip.)
62 *Plantago lanceolata* (Ribwort Plantain).
63 *Mercurialis perennis* (Dog's Mercury).
64 *Ulmus montana* (Wych Elm).
65 *Salix caprea* (Great Sallow).
66 *Corylus Avellana* (Hazel).
67 *Orchis maculata* (Spotted Orchis).
68 *Iris Pseud-acorus* (Yellow Iris).
69 *Narcissus Pseudo-narcissus* (Daffodil).
70 *Galanthus nivalis* (Snowdrop).
71 *Endymion nutans* (Blue-bell).

Taking Marlborough Plants as a guide in settling the second point, there are no species which as a rule (taking the average of the last ten years) flower in January, and only seven in FEBRUARY, viz.:—

No. in List.	Feb.		Earliest.	Latest.
70	1	*Galanthus nivalis* (Snowdrop)	Jan. 11	Feb. 20
58	7	*Veronica hederifolia* (Ivy-leaved Speedwell)	By Jan. 1	Feb. 20
66	8	*Corylus Avellana* (Hazel)	Jan. 17	Mar. 10
2	14	RANUNCULUS FICARIA (Pilewort)	Jan. 26	Mar. 6
63	21	*Mercurialis perennis* (Dog's Mercury) ...	Feb. 1	Mar. 27
6	27	*Cardamine hirsuta* (Hairy Bitter Cress)...	Feb. 6	April 8
		TUSSILAGO FARFARA (Coltsfoot)	Feb. 11	April 1

For March have been selected—

No. in List.	March		Earliest.	Latest.
25	1	*Potentilla Fragariastrum* (Barren Strawberry)	Jan. 18	April 7
36	3	*Petasites vulgaris* (Butter-bur)	Feb. 18	April 10
9	4	*Viola odorata* (Sweet Violet)	Feb. 16	Mar. 25
65		*Salix caprea* (Great Sallow)	Feb. 16	April 3
69	6	*Narcissus Pseudo-narcissus* (Daffodil)	Feb. 12	April 3
64	7	*Ulmus montana* (Wych Elm)	Feb. 5	April 1
8	9	*Draba verna* (Whitlow Grass)	Feb. 26	April 6
1	11	Anemone nemorosa (Wood Anemone)	Feb. 27	April 6
4	15	Caltha palustris (Marsh Marigold)	Feb. 14	April 13
57	20	*Nepeta Glechoma* (Ground Ivy)	Mar. 3	April 9
22	29	Prunus spinosa (Blackthorn)	Feb. 20	April 16
61	30	Primula veris (Cowslip)	Mar. 19	April 7
		For April.		
	April			
30	1	*Anthriscus sylvestris* (Cow Chervil)	Mar. 16	April 21
7	6	*Cardamine pratensis* (Cuckoo-flower)	Mar. 12	April 22
12	9	*Stellaria Holostea* (Greater Stitchwort)	Mar. 25	April 24
71	11	Endymion nutans (Blue Bell)	Mar. 31	April 22
52	15	*Veronica Chamædrys* (Germander Speedwell)	Mar. 12	May 4
62	18	*Plantago lanceolata* (Ribwort Plantain)	April 3	April 28
3	19	*Ranunculus acris* (Upright Crowfoot)	April 5	May 15
20	22	*Vicia sepium* (Bush Vetch)	April 14	May 5
50	24	*Symphytum officinale* (Comfrey)	April 16	April 30
10	28	*Polygala vulgaris* (Milkwort)	April 13	May 7
60		*Ajuga reptans* (Bugle)	April 15	May 5
16	30	Geranium Robertianum (Herb Robert)	April 27	May 4
		For May.		
	May			
51	5	*Pedicularis sylvatica* (Red Rattle)	April 18	May 31
32	6	*Galium Aparine* (Cleavers)	April 28	May 17
17	12	Trifolium repens (Dutch Clover)	April 30	May 23
24		*Potentilla anserina* (Silver-weed)	May 5	May 21
18	13	*Lotus corniculatus* (Bird's Foot)	May 1	May 28
39	16	*Chrysanthemum Leucanthemum* (Ox-eye)	May 9	May 22
46		*Hieracium Pilosella* (Mouse-ear Hawkweed)	May 5	June 3
11	20	*Lychnis Flos-cuculi* (Ragged Robin)	May 7	May 31
21	29	*Lathyrus pratensis* (Meadow Vetchling)	May 15	June 11
5	31	*Papaver Rhœas* (Red Poppy)	May 12	June 16
38		Achillea Millefolium (Milfoil)	May 21	June 21
68		*Iris Pseud-acorus* (Yellow Iris)	May 15	June 12
67		*Orchis maculata* (Spotted Orchis)	May 20	June 11

For June.

No. in List.	June		Earliest.	Latest.
26	1	*Rosa canina* (Dog Rose)	May 22	June 18
55	2	*Thymus Serpyllum* (Wild Thyme).........	May 26	June 8
18	8	MALVA SYLVESTRIS (Common Mallow)...	May 18	June 19
59	7	*Stachys sylvatica* (Hedge Woundwort) ...	May 81	June 14
28	10	*Epilobium montanum* (Broad Willow-herb)	June 4	June 17
41	11	*Senecio Jacobæa* (Ragwort)	May 17	June 80(?)
23	16	*Spiræa Ulmaria* (Meadow-sweet)	June 2	June 25
42		CENTAUREA NIGRA (Black Knap-weed) ...	June 7	June 24
56		*Prunella vulgaris* (Self-heal)...............	June 6	June 22(?)
19	18	*Vicia Cracca* (Tufted Vetch)	June 8	July 1
83	20	*Galium verum* (Yellow Bedstrew)	May 26	June 80(?)
44	End	*Carduus arvensis* (Field Thistle)	June 10	July 10

For July and later Months.

14 *Hypericum tetrapterum* (Square St. John's Wort).
15 ,, *pulchrum* (Upright St. John's Wort).
27 *Epilobium hirsutum* (Great Hairy Willow-herb).
29 *Angelica sylvestris* (Wild Angelica).
81 HEDERA HELIX (Ivy).
84 *Dipsacus sylvestris* (Teasel).
85 *Scabiosa succisa* (Devil's-bit).
40 *Artemisia vulgaris* (Mugwort).
43 *Carduus lanceolatus* (Spear Thistle).
45 *Sonchus arvensis* (Corn Sow-Thistle).
47 CAMPANULA ROTUNDIFOLIA (Hair-bell).
48 *Gentiana campestris* (Field Gentian).
49 CONVOLVULUS SEPIUM (Greater Bindweed).
54 *Mentha aquatica* (Water Mint).
58 *Galeopsis Tetrahit* (Hemp-nettle).

It has been impossible to give any definite arrangement of these last fifteen according to time of flowering, as absence from Marlborough during July has prevented any records of first flowering being taken.

REMARKS AND SUGGESTIONS.

It would be very advisable that all intending observers should note the *localities* where the different species grow in their neighbourhood; so that they may refer to the plants at any time.

Non-botanical observers are advised to make themselves acquainted with the species enumerated in the list, especially when in full flower, as it will greatly aid them in recognising them when coming into flower.

Though a limited number of species are entered in the list, it will be of great use for subsequent revision if other species also are noted; and those

who are able to do so are hereby requested to observe as many species as possible.

It will frequently be of great service to note when species under observation are in bud, and to continue doing so till they come into flower. A hot day will bring many species into flower; and if records of the plants being in bud exist up to the day of flowering, it renders the date far more certain.

If a plant appears to have been in flower for a day or two before observation, the word "by" had better be placed before the date.

Some species will come into flower in one locality before they do so in others; all such cases should be noted.

Extra-early flowers should be recorded, but the dates should not be taken as those of the "first flowering" of the species observed.

As a rule, the species may be considered in flower when the stamens can be distinctly seen; at the same time it should be noted whether other specimens of the same species are nearly out, and, if not, the specimens should be left and observed a day or two later on. Plants frequently remain in bud for a long time, if the weather is unfavourable; all such instances should be carefully noted.

Though cultivated specimens may be observed, the observations should always be recorded separately, and the dates of flowering of truly wild specimens taken as the proper dates for comparison.

The leafing, fruiting and defoliation of trees are omitted, as experience shows that it is very difficult to come to any agreement on the subject. At the same time, notices on these points will frequently be useful. The leafing of the oak and ash is an instance.

Further points for observations may be adopted as experience proves it to be advisable. At present the subject is in its infancy.

The following remarks about individual species are intended mainly for the use of non-botanical observers. The numbers prefixed refer to those in the first general list of plants for observation.

1. ANEMONE NEMOROSA. When it first comes up the flower is bent downwards, and the stamens are visible long before the plant can be fairly said to be in flower. Perhaps no specimen should be considered to be in flower till the flower is turned upwards.

3. *Ranunculus acris*. There are three plants very similar to one another as regards the flowers. This species is known at once by its *round* flower-stalks (the other two have them channelled). The Buttercup (*R. Bulbosus*) is well worth observation, but was omitted as it appears in only 89 counties. It is known by its channelled flower-stalks, its sepals bent back against the stalk (not spreading at right angles to it), and the swollen base of its stem appearing like a bulb. The creeping crowfoot (*R. repens*) is known by its channelled flower-stalk and creeping stems. It may be found in flower almost all the year through, and is therefore unsuitable for the present purpose.

5. *Papaver Rhœas*. Known by the hairs on the flower-stalk spreading at right-angles to it, not pressed close. It is not the first poppy in flower, and hence care must be taken to observe whether any particular specimen belongs to this species or not.

9. *Viola odorata.* Care must be taken to observe truly wild specimens, as it is in flower, when under cultivation, long before its wild brethren. It is really not the best of the violets for observation for this reason, but has been selected because it is so far more widely distributed than the other species. There is an idea that there are only two species of violets, the sweet, and the "dog" or scentless violet. Those who wish to observe more than the regulation number of species are recommended to include the Hairy Violet (*V. hirta*) and the Wood Violet (*V. Riviniana*). The former is very similar in many respects to the Sweet Violet, but has the leaf-stalks covered with spreading hairs, and is scentless. The Wood Violet is known by the flower-stalks springing from the *branches* and not from the *root*, as in the other two species. There are two important forms of the Wood Violet, which ought to be studied by observers.

20. *Vicia sepium.* Not to be confounded with *Vicia sativa*, which has the flowers solitary or rarely two together, whilst *V. sepium* has the flowers three or four together.

22. Prunus Spinosa. There are three species, united by some persons into one under the name of *P. communis.* As a general rule, *P. spinosa* flowers before the expansion of the leaves. It has not unfrequently been confounded with the Hawthorn (*Cratægus oxyacantha*), and it will be well for intending observers to understand the numerous and obvious differences between the two.

25. *Potentilla Fragariastrum* bears some resemblance to the Strawberry (*Fragaria vesca*). It flowers very much earlier (though some specimens of *F. vesca* are occasionally found at the same time). The most obvious characteristic between the two is the fact that the sepals of *P. Fragariastrum* close over the fruit after flowering, whilst they remain expanded in *F. vesca*; it is also a much more delicate plant than *F. vesca*, but a comparison of the actual specimens will alone enable beginners to discriminate between the two.

31. *Hedera Helix.* Flowers about September or October.

42. Centaurea Nigra. Large specimens are not, at first sight, very dissimilar from those of *C. scabiosa*: *C. nigra* has the leaves lanceolate; *C. scabiosa* has them deeply divided in a pinnate manner.

61. *Primula veris.* Extra early specimens are not unfrequent at times.

66. *Corylus Avellana.* The opening of both the barren and fertile flowers should be noted.

67. *Orchis maculata.* Not to be confounded with *O. mascula*, the early purple Orchis. This species has pale lilac flowers, and comes into flower when *O. mascula* is very nearly over.

70. *Galanthus nivalis.* In warm gardens this comes out early; hence *locality* must be noted, as well as the fact whether plants are generally coming into bloom elsewhere. It may be considered to be in flower when the *heads hang down.*

Report prepared by R. McLachlan, F.L.S., *as to Insects proper to be observed in connection with Seasonal Phenomena, Temperature, &c.*

Having been appointed by the Scientific Committee of the Royal Horticultural Society to confer with a Committee of the Meteorological Society respecting what Insects are best adapted for observation in connection with seasonal phenomena, temperature, &c., I beg to submit my suggestions.

At the outset it struck me that the List ought to be as short as possible, and that results equally valuable could be obtained from observation of a few species, as of many; and practically more valuable, because the observers' attention would be more concentrated.

Furthermore, I thought it highly important that these few species should be all common and familiar insects of general distribution. But it should be left to individual observers to add at discretion any particular species that circumstances render, in particular cases, favourable for observation; it being understood that any addition to (or modification of) the List must be rigidly adhered to, and not varied year by year.

As the activity of most insects so greatly depends upon the state of the weather, independently of actual temperature, it is desirable that the records should be accompanied by notes as to the amount of cloud or sunshine.

The species I have selected are the following:—

Melolontha vulgaris (Cock-Chafer or May-bug).
Rhizotrogus solstitialis (Fern-Chafer).
Apis mellifica (Honey-Bee).
Pieris brassicæ (Large White Cabbage-Butterfly).
Pieris rapæ (Small White Cabbage-Butterfly).
Epinephile Janira (Meadow-brown Butterfly).
Bibio Marci (St. Mark's Fly).
Trichocera hiemalis (Winter Gnat).

In all cases where the slightest doubt exists in the mind of the observer with respect to the species, specimens of the insect should accompany the record.

The time of first appearance of any particular species should be carefully noted, as also the time when it becomes common. This is especially necessary with the two white Butterflies, for, as certain larvæ of these often enter houses and other buildings in order to undergo their transformations, it follows that these will necessarily be developed before the main body of individuals that pass through their transformations out of doors.

Notes on the species here follow:—

The appearance of the Cock-Chafer may be taken as an indication of the near approach of summer.

The Fern-Chafer is a beetle much like the Cock-Chafer in appearance, but very much smaller. It flies in swarms in the evening round any object (trees, the observer, &c.), and indicates that summer has fairly set in.

The Honey-Bee need not be observed after the end of March in spring, or before the end of October in autumn.

The two White Cabbage-Butterflies need only be noticed in their vernal broods. *P. rapæ* always appears before *P. brassicæ*, and care must be taken to avoid mistaking for the latter, hybernated females of *Gonopteryx rhamni* (the Brimstone Butterfly), which appear in fine sunny weather from the earliest advent of spring or the end of winter.

The Meadow-brown Butterfly may be taken as indicating summer.

St. Mark's Fly is a large intensely black hairy dipterous insect with rather long legs, appearing generally about St. Mark's Day (April 25th), and lasting for a very short time.

The Winter-Gnat dances in the air (singly or in little swarms) throughout the winter, excepting during the hardest frosts. A continuous record of its appearance should be kept from Christmas to the end of March.

Occasional appearances in unusual numbers.—It is well-known that certain insects appear occasionally in enormous numbers, and then are comparatively rare, or disappear altogether, for a series of years. *Vanessa cardui* (the Painted Lady Butterfly), *Colias Edusa* and *Hyale* (the Clouded-Yellow Butterflies), *Sphinx Convolvuli* (the Convolvulus Hawk-Moth) are familiar examples. Such exceptional occurrences should be carefully noticed. Meteorologists may thus possibly throw light upon phenomena that have never been satisfactorily accounted for by Naturalists.

Suggestions as to the Acts of Birds most proper to be observed by Metetorologists. By ALFRED NEWTON, M.A., F.R.S.

I HAVE much pleasure in complying with the request of the Meteorological Society that I should point out the particular observations on Birds best adapted to their purpose; and accordingly submit the following list, which I have drawn up after some consideration of the subject and study of similar records and projects. It will be understood to refer only to the United Kingdom.

Some remarks by way of introduction seem, however, needed. It is obvious that to obtain general acceptance none but well-known Birds, and such as are either pretty widely distributed in these islands or excite pretty general interest, should be included, while the peculiarities to be observed in these Birds should be of a kind that may be readily noticed by people who possess no special knowledge of ornithology, but are accustomed to walk about with their eyes and ears open, as is doubtless the case with nearly all the Fellows of the Society which has honoured me by a request for my co-operation. I append to the list, by way of notes, a few special cautions which may help to prevent mistakes among those who now for the first time turn their attention to the subject; but there is one caution of general application on which I wish expressly to dwell.

It constantly happens, especially among the earlier Birds-of-passage in spring, that they will for some days haunt one particular spot before

appearing in others or generally throughout the district. I myself knew a particular reach of a river which was yearly frequented by the Sand-Martin for nearly a week or ten days before examples of that species were to be seen elsewhere in the vicinity. I also knew a parish in which the Chiff-chaff always bred, but not for a month or six weeks after it had arrived in many of the neighbouring parishes was its note to be heard within the limits of that particular parish. I could easily cite other cases of like nature, but many if not most observers of Birds from their own experience will bear me out in this. It follows, therefore, that to render the proposed observations trustworthy, an observer of any fact connected with Birds should set down the exact locality at which it occurred, even if it be but a few miles' distance from his own station, and if possible again record the fact when it recurs there— or *vice versâ*. Otherwise there will naturally be a risk of considerable error, but an attentive observer will probably soon come to find out the localities in his neighbourhood which are first visited by any particular kind of Bird, and after a few years' experience the double observation will very likely prove unnecessary. The arrival of several other common and well-known Birds-of-passage—such as the Wryneck and Nightjar or Goatsucker—might have been added to the list as facts easy to observe, but it seems doubtful whether any good would thereby be gained which will not be effected by observation of the species of spring-migrants therein named, and it has been my object not to encumber the observer unnecessarily.

January.	Skylark—song begins.
	Song-Thrush—song begins (1.)
February.	Chaffinch—song begins.
	Brown (or Tawny) Owl hoots (2.)
March.	*Chiff-chaff—song begins (3.)
	Rook builds.
	*Willow Wren — song begins (4.)
April.	*Nightingale — song begins (5.)
April.	*Swallow—first seen (6.)
	*Cuckoo—first heard (7.)
May.	*Turtle Dove—first seen.
	*Flycatcher— first seen (8.)
	*Swift—first seen (9.)
June.	Partridge hatches.
	Cuckoo changes its note (10.)
July.	Wheatear returns (11.)
August.	Swallows begin to flock.
September.	Chiff-chaff last heard.
October.	*Woodcock first seen (12.)
	*Fieldfare arrives (13.)

[The months named are those in which the event may approximately be expected.]

(1.) The song of this bird is pretty well known every where; but it is possible to mistake for it that of the Mistletoe-Thrush, which is generally heard earlier. The notes of the latter, however, are less musical and connected, its strain is altogether much shorter, and, being repeated many times in succession, wants the variety of that of the Song-Thrush.

(2.) To be heard usually about half-an-hour before sunset, and then at

* These observations will indicate pretty accurately the arrival in the locality of the bird named.

intervals throughout the evening or night. The tremulous note of this Owl is unlike that of any other British bird.

(3) The song consists only of a repetition of the two sounds which cannot be better syllabled than in the form in which the bird's English name is commonly written. It is quite unmistakeable.

(4.) In its joyous burst the song has some resemblance to that of the Chaffinch, but it is not so loud and wants the harsh notes of that bird. It has been remarked of the Willow Wren that it does not arrive until the larches are visibly green.

(5.) Many people would regard as an insult the supposition that they could make any mistake about this unrivalled songster, but it is certain that mistakes are very frequently made. Mr. Stevenson says (Birds of Norfolk, vol. i. p. 124) that from personal inquiry he is convinced that in a large majority of cases the "Early Nightingales" of newspaper paragraphs are Song-Thrushes, heard at a late hour during the long spring evenings.

(6.) The Swallow here meant is that often called the Chimney-Swallow, and may be distinguished from either the House-Martin or the Sand-Martin (to which the names "Window-Swallow" and "Bank-Swallow" have respectively been given by some writers) by its back being of a uniform glossy steel-blue—almost black, its long forked tail and the dingy colour of its lower parts—the House-Martin having the rump and lower parts pure white, while the Sand-Martin is of a mouse-colour above. In most parts of England the Swallow is the first of these three species to appear, but in certain localities the Sand-Martin usually precedes it. The House-Martin is nearly always a few days later than the Swallow.

N.B.—The House-Martin seems at times to be seriously affected by the weather, and its numbers appear to be decreasing throughout England in an unaccountable way. I trust I may be excused for here stating that I should be very glad to receive any facts bearing on this matter.

(7.) Young observers should be on their guard against imitations of this bird's well-known note by idle boys or others.

(8.) The little greyish-brown bird so fond of sitting silently on a post, rail or other perch, whence it can readily dart off and seize a fly, commonly returning to its former station.

(9.) To be distinguished from the Swallow, with which it is often confounded, by its larger size, more rapid flight, and the peculiar shape of its outspread wings, which is nearly that of the tool used in many gardens for paring turf.

(10.) The warning already given (note 7) is almost as necessary here. The syllable prefixed by the bird to its earlier note is generally very distinctly heard.

(11.) On its arrival in spring this bird generally goes straight to its breeding-quarters, and therefore appears but locally at that time and during the breeding-season. Later in the year it is much more widely dispersed, and its appearance betokens the beginning of the great return movement of our migratory birds.

(12.) Though not a year passes without many Woodcock's nests being found somewhere in Great Britain and parts of Ireland, it would seem that the birds which breed and are bred in our islands betake themselves towards the end of summer or very early in autumn to more southern countries, for at the beginning of the shooting season (say in September) the occurrence of this species is very rare. The large immigration of northern examples takes place later, and the first Woodcock of the season is commonly noised abroad in most neighbourhoods. In this particular case the information will most likely be generally received at second-hand, but will probably be none the worse for that, since mistakes concerning the bird's appearance are not much to be feared.

(13.) The Mistletoe-Thrush, which in autumn is wont to fly in flocks, has no doubt been often mistaken for the Fieldfare, but the peculiar note of the latter (frequently uttered on the wing), when once heard, can never fail of recognition.

Nearly all the observations above suggested can be made or collected by most residents in the country generally, and even by some who live in towns; but such observers as dwell at or near the seaside—and especially not far from the stations chosen by various Seafowls for their breeding quarters—are recommended to keep watch for their arrival and departure. It has been frequently asserted that many of these birds, as the Guillemot, Puffin, Razorbill and certain Gulls, resort to and quit their stations punctually on a particular day, regardless of the state of the weather; and if such statements are correct, the facts which render the birds independent of meteorological conditions seem to deserve attention. In some cases the assistance of lighthouse-keepers, if sought, would probably conduce to the success of the inquiry, as they almost always take an interest in the doings of their feathered neighbours. Lighthouse-keepers, it is believed, could also furnish valuable information as to the extraordinary flocks of migrant birds which occur by night at uncertain intervals. These flocks consist of a very heterogeneous assemblage, and it is seldom that the particular kinds can be identified except by the victims that may be found next morning lying dead beneath the glasses against which they have dashed themselves. Similar flocks are occasionally observed inland, and chiefly over or near large towns, whither it may be supposed they have been attracted by the glare of the street lamps. In these latter cases it is seldom that examples are procured to show of what species the flock was composed, but the mere fact of its occurrence is always worthy of record, with the precise hour at which the birds were heard, in a weather report. The cries, whistling and screams of the birds, sometimes even the sound of their wings, are often enough to attract the attention of the most unobservant; and as far as I know, these miscellaneous flocks only occur on perfectly still pitch-dark nights, with a comparatively high temperature and a falling barometer—circumstances that point to an atmospheric cause of the wonderful concourse.

A connection between the habits of birds and meteorological conditions is popularly believed to exist in the case of the Green Woodpecker, the

requent cry of which is said to presage rain; but I have failed to find that his is so. The Redbreast, on the other hand, when singing from an elevated perch at evening, is said to be an unfailing prophet of a fine day on the morrow, while if its parting song be uttered from a lower station bad weather is supposed to follow. As far as my own experience goes, the only connection between changes of weather and the habits of birds (omitting of course hard frost and deep snow, the effects of which are obvious) is, that many birds seem to be more alert or "wilder," as the sportsmen say, for a day or two before a heavy downfall: I have observed this with Partridges, Plovers and Snipes.

Report prepared by PROF. W. T. THISELTON DYER, F.L.S.

HAVING had the advantage of perusing the draft reports prepared by the President of the Meteorological Society and the Rev. T. A. Preston, I find that my own suggestions may be put into a very brief form.

I am strongly of opinion, that with regard to the periodic phenomena of plants, it will be best to confine the observations—at any rate at first—to the time of flowering.

It is quite obvious, that even with this limitation, the observations will be of very little value unless there is tolerable certainty that the plants observed are really the species the observers believe them to be.

I feel, however, quite certain that the list prepared by Mr. Preston far exceeds in number of species the proportion of our whole indigenous plants which would be accurately determined by every member of a body of observers sufficiently large to really produce valuable results.

I think the number of plants should be barely more than a dozen—at any rate, to begin with. It is obviously very important to get a large and complete set of observations for each species, and this is much more likely to be done if the number of species chosen is small.

So extraordinary are the blunders which even intelligent persons make about the identification of plants, that I think that with even no more than a dozen of the commonest and most characteristic plants it would be necessary to take special precautions.

In the first place, I think the Society would do well to issue to every observer a set of figures of the plants to be observed. These might be obtained at no great cost from the publishers of 'English Botany,' a work which includes a figure of every indigenous flowering plant.

Next, I think, it would be essential that each observer should dry roughly, under pressure, a specimen of each of the plants observed by him. These should be sent up to the person who would undertake the general supervision of this class of observation; and special value would necessarily attach to observations in respect to which there was this guarantee that they had been accurately made.

If the specimens (which might be the merest scraps) were collected when the observations were made, a further notion would be obtained of the *phase*

of vegetation which each observer looked upon as 'flowering,' which would certainly vary. The observations might in this way even admit of slight correction.

In drawing up lists of plants desirable for the observations, I should have made use of the same materials as Mr. Preston, namely Mr. Watson's Topographical Botany, and Mr. Preston's own results at Marlborough. I have, therefore, not hesitated to select the plants in my list from the lists given by Mr. Preston. If I thought it possible that the observations could be carried out on so large a scale, I should not hesitate to endorse the whole selection of species which Mr. Preston has made.

Proposed List.

(Mean date of Flowering from Mr. Preston's observations at Marlborough.)

Feb. 8.	*Corylus avellana.*
March 7.	*Tussilago farfara.*
March 11.	*Anemone nemorosa.*
April 11.	*Endymion nutans.*
May 16.	*Chrysanthemum leucanthemum.*
May 31.	*Papaver rhœas.*
June 16.	*Spiræa ulmaria.*
June 25.	*Carduus arvensis.*
	Hedera helix.
	Campanula rotundifolia.
	Convolvulus sepium.
	Mentha aquatica.

If it were thought desirable to have a larger list, I would add the following:

Ranunculus ficaria.
Prunus spinosa.
Ranunculus acris.
Centaurea nigra.
Epilobium hirsutum.
Carduus Lanceolatus.

A Meeting was held on January 19th, 1875, at 30 Great George Street, to receive the above Reports and for discussion on the subject. The following is a copy of the minutes :—

"Present :—Dr. G. J. Allman, Dr. Mann, Rev. T. A. Preston, Messrs. Bentley, Eaton, Newton, Scott, and Symons. Chairman, Dr. Allman; Secretary, Mr. Symons.

"The minutes of the preceding meeting were read and confirmed.

"The Secretary read the following letters :—

"The Wakes, Selborne,
"Alton, Hants,
"January 18th, 1875.

return the Reports with which you favoured me, and beg to say ppear to me to be well and judiciously drawn up. My time is at

present so fully occupied that I have not been able to devote the attention to the subject which it deserves, but it is evident that it is in good hands. I would take the liberty of suggesting that there might possibly be some useful hints obtained from any of the editions of White's "Natural History of Selborne," which contain his own and Markwick's *observations* and *lists*. The edition of 1802, and several subsequent ones, have both. My friend, Professor Newton, doubtless has some one of them. I regret that it is not possible for me to attend the meeting to-morrow.

"I remain, Sir,
"Yours truly,
"THOMAS BELL."

"William Marriott, Esq."

"Strathfield Turgiss Rectory,
"Winchfield, Hants,
"January 18th, 1875.

"My dear Sir,—I have carefully read over the Hints and Suggestions for the observation of Natural Phenomena illustrating the periodical return of the Seasons, and have very little indeed to add upon the subject. I would, however, remark that the lists of Birds, Insects, and Plants should be as short as possible, a dozen or twenty well-marked and well-known species being quite sufficient. I would also most strongly recommend to each intending observer not to record any observation unless he be perfectly certain that the bird, plant or insect be actually the species he supposes it to be. Indeed, I would suggest that no one be recommended as an observer of Natural Phenomena unless he really knows something about natural science, and even then only of that department in which he is skilled. Having had the teaching of science classes for nearly 20 years, I can, without presumption, say that the mistakes made by persons of intelligence and supposed observation are often so ludicrous, that unless each keeps to his own line of study, and leaves other branches to those who know something about them, we shall gain but little by our observations, if we escape ridicule:—"*ne sutor ultra crepidam*" should be our motto in this matter.

"I would also suggest the Latin name be in all cases insisted upon, as the local cognomina of both plants and animals are generally very marvellous.

"In the list of Insects the *Gonopteryx Rhamni* (Sulphur Butterfly) should find a place, as it is an early harbinger of spring. And but one species of *Pieris* should be retained, to avoid confusion.

"Yours very faithfully,
"C. H. GRIFFITH."

"The Reports printed above were received, and thanks voted to the respective authors.

"Copies of these Reports being in the hands of all the delegates, they were taken as read, and their discussion was proceeded with.

"Their general merit was unanimously acknowledged, but several of the delegates expressed the opinion that if any but proficients in the several branches of Natural History were to be accepted as observers, their attention must be directed to plants very well known and which were possessed of the strongest individuality of character. It was accordingly resolved that while the list in the Report of the Rev. T. A. Preston should be accepted and printed in its entirety, certain plants, viz. the following, should be printed in capital letters, and the attention of all observers specially requested to their phenology :—

RANUNCULUS FICARIA (Pilewort).
TUSSILAGO FARFARA (Coltsfoot).
ANEMONE NEMOROSA (Wood Anemone).
CALTHA PALUSTRIS (Marsh Marigold).
PRUNUS SPINOSA (Blackthorn).
PRIMULA VERIS (Cowslip).
ENDYMION NUTANS (Blue Bell).
GERANIUM ROBERTIANUM (Herb Robert).
TRIFOLIUM REPENS (Dutch Clover).
ACHILLEA MILLEFOLIUM (Milfoil).
MALVA SYLVESTRIS (Common Mallow).
CENTAUREA NIGRA (Black Knap-weed).
HEDERA HELIX (Ivy).
CAMPANULA ROTUNDIFOLIA (Hair-bell).
CONVOLVULUS SEPIUM (Greater Bindweed).

"It was decided that the issue of plates was inexpedient.

"It was decided that observers be requested, whenever practicable, to enclose with their reports the specimens on which those reports were based, at any rate for the first year.

"It was resolved that particulars of the Aspect in which the specimens were found be requested.

"It was resolved that the date of appearance of Frog spawn be noted.

"It was decided that the first appearance of the *Gonopteryx rhamni* (Sulphur Butterfly) be reported.

"It was resolved that a code of rules for observers, embodying the above resolutions and so much of the Reports as may be necessary, and in accordance with the said resolutions, be prepared, printed and circulated at the discretion of the Secretary.

"The Rev. T. A. Preston kindly consented to assist the Conference by preparing these Instructions.

"A Form for the record of the phenological observations, and for their monthly report, was agreed to.

"The thanks of the Conference were unanimously voted to Dr. Allman for his able conduct in the chair.

"The Meeting then adjourned."

DISCUSSION.

Mr. BUDD thought that observers should be requested to state whether there was an abundance or not of insects. The number of butterflies was very marked in 1868.

MAJOR HOTCHKISS thought it a great omission that no mention had been made of the leafing of trees. Great importance is attached to this in America, and elaborate Tables have been published by the Smithsonian Institution on the subject. The three most important observations for agriculture are the times of foliation, flowering, and ripening of the seed.

The PRESIDENT said that the question of the leafing of trees had been very carefully discussed by the Conference, and that it had been generally felt that such leafing was but an uncertain and unsatisfactory indication of season in this country.

MAJOR HOTCHKISS said that in long railway journeys in the United States, the phenomenon of leafing is very striking.

The PRESIDENT remarked that the change of season in America was very much more prompt and distinctly marked than it is in England.

Mr. BUDD remarked that there was an old saying,

"Ash before the oak
Sure to have a soak."

XXXI. *On the Weather of Thirteen Summers.* By R. STRACHAN, F.M.S.

[Received November 27th, 1874. Read February 17th, 1875.]

Summary and Remarks for June.—The length of the day in the middle of this month extends to 16h. 32m. The sun attains his greatest declination, north of the equator, on the 21st. The mean heat rises in the *day*, in the shade, to 69°, and falls in the *night* to 51°, the mean range being 18°. The medium temperature, 60°, is also that at nine o'clock in the morning. At this hour the normal pressure of the atmosphere is 30·025 inches of mercury. The prevailing winds are from W b N. The average amount of rain is 2·02 inches, which falls on 11 days. There is less mist in June than in any other month. About 5 days are usually clear, 15 fine, and 10 dull or overcast. On the average June has one thunderstorm.

The maximum pressure was in 1865, with resultant NNE wind, rain on only 8 days, the finest weather, and high temperature.

The minimum pressure was in 1862, with strong winds from WNW, low day temperature, the greatest frequency of rain, and cloudy weather..

The highest temperatures happened in 1868 and 1870, with pressure above the average; the minimum depth and frequency of rain, with very fine weather, in 1868, though the resultant wind was westerly; and with cloudy weather in 1870, with WNW winds.

The coldest June was 1871, with northerly winds, pressure below the average, much rain, and the most overcast weather.

The largest rainfall occurred in 1863, with pressure below the average, temperature 2° below the day mean, cloudy weather, and three thunderstorms.

The least rainfall was in 1870, with WNW winds, high pressure, very high day temperature, but the weather was not so clear as usual; while in 1868, when the rainfall, pressure and temperature were nearly similar, but the wind from the south of west, the weather was the finest. The most overcast weather was in 1871, with excessive rain.

The strongest resultant wind was WNW, in 1862, with the least pressure. The winds were mostly from SW in 1866, with pressure below the average, temperature and rainfall above their averages, and fine weather. They were the most north-easterly in 1865, with pressure above, temperature and rainfall below, the means, weather very fine.

Summary and Remarks for July.—The length of the middle day is 16h. 5m. The sun is now returning southward towards the equator, nevertheless, the maximum temperature of the year occurs in this month. The mean highest temperature in the shade by *day* is 73°, mean lowest by *night* 55°, giving a mean daily range of 18°, the same as in June. The medium temperature, 64°, is higher than the 9 a.m. temperature. The normal pressure of the air at 9 a.m. is 29·99 inches; with resultant wind from W. July has the least frequency of rain, which averages 11 days, and 1·89 inches. On the whole it is a finer month than June, for it averages only 7 overcast days, while it has 19 fine, and 5 very fine; and usually 2 thunderstorms. Of all the months of the year July has the greatest number of fine days, the least of overcast and rainy weather, though thunderstorms are most frequent.

The maximum mean pressure was in 1864, with resultant WNW winds, the night temperature 4° below the average, and there was little rain, otherwise the weather was not remarkably fine.

The minimum mean pressure was in 1861, with SW winds very persistent, day temperature 3° below the average, weather unusually cloudy (the rain was not observed).

The hottest July was 1868, when there were the least frequency and amount of rain, the maximum of fine weather, with northerly winds.

The coldest July was 1862, when the day temperature was 7° below the average, the winds strong from W, with frequent rain and much cloudiness.

The largest rainfall was in 1867, with resultant W b S wind; the most frequent rain happened in 1871, with strong W b S winds; pressure and temperature were below their averages.

The least amount and frequency of rain occurred in 1868, with resultant N b E wind, pressure and temperature above their averages, and the finest weather.

The most overcast weather was in 1871, with the most frequent rain.

Summary and Remarks for August.—The length of the middle day is 14h. 32m. The sun is still progressing southward towards the equator. The temperature is only slightly inferior to that of July, rising in the shade on a mean by *day* to 70°, and falling by *night* to 54°; thus ranging on a mean 16° daily, or 2° less than in July or June. The medium tempera-

ture, 62°, is only slightly above that at 9 a.m. The normal pressure at 9 a.m. is 29·98 inches; and the prevalent winds are from the west. The rain averages 2·32 inches on 13 days. Except in the greater frequency and quantity of rain, there is little difference between August and July. There are usually 5 very fine days, 18 fine, and 8 overcast, and 2 thunderstorms.

The mean pressure appears to vary even less in August than in June and July. The maximum was in 1864, with prevalent winds from WNW, when the temperature by night was 5° below the average, the maximum of fine weather, and only about half the average frequency and amount of rain.

The minimum mean pressure was in 1866, with winds from west, when the day temperature was 3° below the average, and there was the maximum number of overcast, rainy days.

The maximum temperature was in 1871, entirely due to warm days. The pressure was also above the average, but the winds were from SW chiefly, though variable. The amount and frequency of rain were at the minimum, and the weather unusually fine, with mist frequent in the mornings.

The temperature in 1868 was high by day and by night, the pressure below the average, the wind variable, but chiefly from WSW; yet the rainfall and weather were about the average.

The difference between the weather of 1868 and 1871 seems to have depended upon the relative moisture of the winds.

August 1863 was remarkably cloudy. It had, also, a prevalence of SW winds.

The monthly means for 1862, 1870, 1872, 1873, agree closely with the average values for pressure, temperature, rain and weather, the resultant winds being respectively N 77 W, 0·8; N 11 W, 1·0; N 78 W, 0·7; and S 72 W, 1·9.

The maximum amount of rain fell in 1865, and this month had four thunderstorms, with pressure and temperature below the averages.

Summary and Remarks on the Summer.—Each of the months, June, July, and August exhibits a predominance of winds from SW, W and NW, with almost identical values for the mean forces under the respective directions. The prevalent winds of Summer may be said to be westerly. The mean pressure is about 30 inches; the medium temperature in the shade 4 feet above the ground 62°, and the mean daily range 18°. The rainfall amounts to 6·23 inches, and on an average occurs on 35 days out of the 92.

About 15 days may be reckoned upon as very fine, 52 as fine, 25 as overcast. Misty and foggy weather very seldom occur. The averages show that the winds, both as regards direction and force, are very similar in each of the months of Summer. For the entire season their relative frequency is: N, 9; NE, 8; E, 9; SE, 3; S, 7; SW, 16; W, 28; NW, 10; calms, 2: or polar 31, equatorial 59.

The variability of the monthly means is less in summer than in any other season. The mean pressure has been as low as 29·77 inches in July, and as high as 30·23 inches in June; the 9 a.m. mean temperature down to 56° in June, and up to 67° in July. If any thing, the variability in August is the

Results of Meteorological Observati

Year.	Barometer.	Temperature.			Rainfall.		Notati	
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.	c.
	In.	°	°	°	In.			
1861	29·991	60·9	68·6	54·8	—	—	5	1
1862	29·900	57·8	63·7	52·0	2·45	20	4	1
1863	29·904	59·0	67·0	52·2	4·05	15	—	1
1864	29·974	59·3	67·3	47·5	1·51	11	2	1
1865	30·226	61·4	72·3	52·6	1·61	3	13	
1866	29·956	62·1	70·7	53·8	3·58	15	10	
1867	30·120	60·0	69·0	52·0	1·10	7	9	
1868	30·171	62·6	73·9	53·6	0·80	5	10	1
1869	30·097	57·4	65·9	44·9	1·04	8	7	1
1870	30·132	60·9	75·9	53·1	0·75	5	5	1
1871	29·943	55·8	66·0	49·4	3·24	14	2	
1872	29·926	60·0	71·3	52·4	2·17	17	4	1
1873	29·983	59·2	70·5	52·7	1·94	12	3	1
Means	30·025	59·6	69·4	51·6	2·02	11	6	1

Observations of Wind, referred to 16 Poi

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.		S
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.
1861	4	2·8	3	3·3	1	2·0	2	1·5	5	2·6	1	1·0	1	2·0	—	—	1
1862	2	2·5	1	4·0	—	—	—	—	—	—	—	—	—	—	1	3·0	2
1863	1	1·0	—	—	1	2·0	—	—	—	—	—	—	2	2·5	2	3·0	—
1864	—	—	1	2·0	3	1·7	—	—	—	—	—	—	—	—	—	—	1
1865	5	2·8	—	—	4	3·0	1	3·0	7	1·9	1	1·0	1	2·0	1	2·0	—
1866	2	1·0	—	—	1	1·0	3	2·3	3	1·3	—	—	1	3·0	—	—	2
1867	5	2·2	1	2·0	3	3·3	2	1·5	2	1·0	—	—	—	—	—	—	1
1868	1	4·0	1	2·0	1	2·0	2	1·5	3	2·7	—	—	—	—	—	—	1
1869	1	1·0	3	2·3	2	2·5	1	1·0	3	2·0	—	—	—	—	—	—	—
1870	3	2·0	2	2·5	2	5·0	1	2·0	1	1·0	—	—	—	—	—	—	2
1871	10	2·7	2	4·0	5	3·2	—	—	2	2·0	—	—	—	—	—	—	1
1872	—	—	—	—	—	—	—	—	2	2·0	—	—	1	2·0	—	—	1
1873	2	1·5	—	—	3	3·0	1	2·0	4	2·5	—	—	1	2·0	—	—	2
Means	2·8	2·4	1·1	2·9	2·0	2·9	1·0	1·9	2·5	2·0	0·2	1·0	0·5	2·3	0·3	2·7	1·1

r Thirteen months of June in London.

Weather at 9 a.m.				Notations of Day's Weather.					
o.	m.	f.	r.	b.	c.	o.	m.	f.	lt.
14	1	—	3	5	16	9	3	—	3
11	—	—	1		18	10	—	—	1
16	—	—	1	—	18	12	—	—	3
12	2	—	1	1	24	5	—	—	1
9	1	—	—	15	10	5	—	—	—
14	1	—	—	10	10	10	—	—	2
15	—	—	—	8	12	10	—	—	—
2	—	—	—	13	16	1	—	—	—
13	—	—	1	4	16	10	—	—	—
13	1	—	—	3	16	11	—	—	1
22	—	—	1	—	9	21	—	—	1
14	2	—	1	2	19	9	—	—	3
13	1	—	1	—	15	15	—	1	—
13	1	—	1	5	15	10	—	—	1

h mean of force (by Scale 0 to 12).

SSW.		SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms.	Resultant.	
O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
—	—	3	3·3	2	2·0	4	2·0	—	—	2	2·0	1	2·0	—	$^{\circ}$ N	0·5
1	6·0	1	8·0	2	5·5	5	3·0	2	2·5	10	3·5	3	4·0	—	N 73 W	2·2
1	2·0	2	3·5	2	3·0	10	2·7	—	—	7	2·7	2	1·5	—	N 86 W	1·5
2	2·0	3	3·0	4	2·3	13	3·4	1	3·0	1	2·0	1	2·0	—	S 86 W	2·0
—	—	2	2·5	3	3·3	3	2·0	1	3·0	—	—	—	—	1	N 23 E	0·5
3	2·7	8	2·8	3	4·0	4	2·5	—	—	—	—	—	—	—	SW	1 2
1	1·0	1	4·0	4	2·5	5	1·8	—	—	2	1·5	2	3·0	1	N 34 W	1·0
3	2·3	—	—	5	2·2	11	2·0	1	2·0	1	3·0	—	—	—	S 85 W	0·9
2	3·0	—	—	6	3·5	9	1·9	1	3·0	2	4·0	—	—	—	N 83 W	1·2
—	—	3	2·3	2	2·5	7	2·4	3	4·7	2	4·0	—	—	2	N 68 W	1·2
—	—	4	2·2	2	2·5	1	3·0	2	2·0	1	2·0	—	—	—	N	1·3
1	6·0	5	3·8	4	4·0	10	2·5	—	—	2	2·5	2	3·5	2	S 71 W	2·0
1	2·0	2	4·5	1	5·0	11	2·0	—	—	2	2·5	—	—	—	W	0·6
1·2	2·8	2·6	3·2	3·1	3·2	7·2	2·4	0·8	3·1	2·5	2·9	0·8	2·9	0·4	N 78 W	1·0

Results of Meteorological Observati

Year.	Barometer.	Temperature.			Rainfall.		Notati	
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.	c.
	In.	°	°	°	In.			
1861	29·771	62·2	70·1	56·1	—	—	2	
1862	29·946	59·8	66·7	53·8	2·27	17	3	
1863	30·145	61·8	72·0	54·0	0·92	4	5	
1864	30·195	61·7	72·7	51·1	0·47	8	10	
1865	29·982	63·0	73·8	56·3	1·77	13	12	
1866	29·950	61·8	71·5	54·0	2·26	11	4	
1867	29·906	60·9	70·4	53·1	3·98	14	6	
1868	30·089	67·4	79·5	57·9	0·45	4	12	
1869	30·115	64·4	75·5	56·4	0·65	6	6	
1870	30·004	64·0	77·7	57·5	1·26	12	9	
1871	29·860	60·8	72·2	54·6	3·82	20	7	
1872	29·937	65·1	78·7	58·0	3·30	15	2	
1873	29·973	63·0	75·0	56·0	1·52	10	11	
Means	29·990	62·8	73·5	55·3	1·89	11	7	

Observations of Wind, referred to 16 Poi

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.		S.
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.
1861	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	2·7	6
1862	2	2·5	—	—	2	1·0	—	—	—	—	—	—	1	6·0	—	—	1
1863	2	3·0	2	2·0	—	—	—	—	4	2·0	—	—	2	2·0	1	4·0	1
1864	1	1·0	4	2·2	1	4·0	3	2·0	1	1·0	—	—	2	1·0	—	—	—
1865	2	4·5	—	—	1	2·0	1	2·0	4	1·7	—	—	—	—	—	—	3
1866	2	1·5	1	3·0	2	2·5	3	2·0	4	1·5	—	—	—	—	—	—	2
1867	3	1·7	—	—	1	1·0	2	1·5	2	1·0	—	—	—	—	—	—	3
1868	5	2·4	5	3·6	2	5·0	—	—	5	1·8	—	—	—	—	—	—	1
1869	1	1·0	—	—	4	1·2	3	1·3	2	1·5	—	—	—	—	1	2·0	2
1870	2	1·0	—	—	6	2·3	—	—	3	3·0	—	—	1	1·0	—	—	2
1871	1	1·0	1	5·0	1	2·0	—	—	2	1·5	—	—	—	—	—	—	—
1872	5	2·2	—	—	1	2·0	—	—	—	—	—	—	2	2·5	2	1·5	5
1873	—	—	—	—	—	—	—	—	1	2·0	—	—	—	—	—	—	3
Means	2·0	1·8	1·0	3·0	1·6	2·2	0·9	1·8	2·2	1·8	—	—	0·7	2·2	0·5	2·4	2·2

irteen months of JULY in London.

ather at 9 a.m.				Notations of Day's Weather.					
	m.	f.	r.	b.	c.	o.	m.	f.	lt.
	—	—	7	—	24	7	—	—	7
	3	—	2	3	19	9	2	—	1
	3	—	2	7	21	3	2	—	—
	4	—	1	3	26	2	—	—	1
	—	—	2	10	13	8	1	—	2
	1	—	3	7	13	11	—	—	1
	—	—	3	3	17	11	1	—	1
	—	—	—	13	14	4	—	—	2
	—	—	1	5	21	5	—	1	—
	—	—	1	6	13	12	—	—	3
	1	—	5	2	16	13	—	—	—
	3	—	2	3	24	4	—	—	6
	1	—	2	8	17	6	—	—	1
	1	—	3	5	19	7	1	—	2

nean of force (by Scale 0 to 12).

W.	SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms.	Resultant.	
F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
2·7	5	2·6	3	3·7	2	3·5	1	2·0	6	2·7	2	2·5	—	S 48° W	1·8
2·0	7	3·7	1	7·0	10	3·5	1	4·0	4	4·5	1	2·0	—	S 84 W	2·3
5·0	1	2·0	1	1·0	3	3·7	3	2·3	6	2·7	2	1·0	2	N 69 W	0·7
—	3	3·0	5	2·6	5	3·8	4	2·2	2	3·0	—	—	—	N 75 W	1·2
2·0	10	4·2	4	2·5	2	2·5	2	2·5	1	1·0	—	—	—	S 57 W	1·5
—	1	4·0	4	3·7	9	4·5	1	1·0	2	5·0	—	—	—	N 83 W	1·6
1·0	3	4·0	5	3·2	9	2·3	—	—	1	4·0	—	—	1	S 76 W	1·4
—	3	1·0	3	2·3	4	1·5	—	—	2	2·0	—	—	1	N 10 E	1·0
3·0	2	1·5	5	2·2	6	2·0	—	—	2	1·5	1	3·0	1	S 77 W	0·6
—	2	2·0	2	2·5	9	1·8	2	5·0	1	4·0	—	—	1	N 54 W	0·6
—	6	3·8	10	4·5	8	3·1	—	—	1	6·0	1	5·0	—	S 78 W	2·7
1·5	2	1·0	2	2·0	7	2·4	—	—	1	2·0	2	3·0	—	S 80 W	0·7
2·0	5	2·8	2	3·5	15	2·5	1	2·0	1	4·0	—	—	1	S 69 W	2·0
2·4	3·8	3·1	3·6	3·2	6·8	2·8	1·2	2·7	2·3	3·1	0·7	2·6	0·5	S 82 W	1·2

Results of Meteorological Observati

Year.	Barometer.	Temperature.			Rainfall.		Notal
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.
	In.	°	°	°	In.		
1861	30·050	63·0	71·8	57·4	—	—	6
1862	29·967	60·9	67·3	54·6	2·45	12	3
1863	29·926	62·7	71·4	55·6	1·77	17	—
1864	30·112	58·5	70·6	49·6	1·29	9	17
1865	29·894	60·0	67·5	53·5	4·74	19	7
1866	29·809	59·6	67·3	53·2	2·79	20	2
1867	30·016	62·8	70·9	56·0	2·48	10	8
1868	29·919	64·1	72·6	56·9	2·34	14	4
1869	30·090	60·9	71·0	54·1	1·22	11	11
1870	29·983	60·6	70·9	53·1	2·73	9	8
1871	30·051	64·1	74·8	53·8	0·86	6	16
1872	29·987	60·7	69·7	54·5	2·27	12	6
1873	29·946	62·0	72·2	55·0	2·85	16	7
Means	29·981	61·5	70·6	54·4	2·32	13	7

Observations of Wind, referred to 16 Po

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.		S
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.
1861	—	—	—	—	—	—	—	—	—	—	—	—	1	2·0	—	—	2
1862	3	1·7	3	2·7	2	2·5	—	—	—	—	—	—	3	3·0	—	—	1
1863	—	—	—	—	1	2·0	—	—	1	3·0	2	3·5	1	4·0	1	3·0	2
1864	4	1·5	—	—	2	2·5	2	2·0	3	1·3	—	—	—	—	—	—	—
1865	1	4·0	—	—	3	2·0	1	1·0	—	—	1	2·0	—	—	—	—	—
1866	3	2·3	1	1·0	—	—	1	1·0	3	1·0	—	—	—	—	—	—	3
1867	1	2·0	—	—	—	—	1	1·0	1	2·0	—	—	—	—	1	3·0	1
1868	2	2·5	—	—	2	3·0	—	—	7	1·7	—	—	1	3·0	—	—	4
1869	2	2·0	1	1·0	3	3·0	3	1·3	7	1·4	—	—	—	—	—	—	1
1870	2	2·0	2	3·5	4	3·0	3	3·7	3	1·7	—	—	—	—	—	—	1
1871	—	—	1	1·0	2	2·5	2	2·5	5	1·4	1	1·0	1	1·0	1	1·0	4
1872	5	3·0	1	8·0	2	2·0	—	—	2	2·0	2	4·5	3	2·0	1	4·0	1
1873	—	—	—	—	1	3·0	—	—	1	3·0	—	—	—	—	1	2·0	1
Means	1·8	2·3	0·7	2·9	1·7	2·6	1·0	2·1	2·5	1·6	0·5	3·2	0·8	2·5	0·4	2·6	1·6

Thirteen months of August in London.

ather at 9 a.m.				Notations of Day's Weather.					
	m.	f.	r.	b.	c.	o.	m.	f.	lt.
	5	—	1	7	20	4	4	—	—
	4	1	2	4	23	4	2	—	—
	—	—	4	—	24	7	6	—	2
	4	—	4	11	20	—	—	—	1
	3	—	5	2	18	11	3	—	4
	1	—	2	2	13	16	1	—	—
	1	—	3	8	14	9	—	—	3
	—	—	4	4	17	10	1	—	1
	1	—	3	8	10	13	—	—	2
	1	1	3	5	23	3	—	1	1
	8	—	—	11	15	5	1	—	2
	2	—	5	5	16	10	—	—	2
	—	—	—	3	16	12	—	—	2
	2	—	3	5	18	8	1	—	2

mean of force (by Scale 0 to 12).

W.	SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms.	Resultant.	
F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
3·0	3	2·3	2	4·0	11	2·5	4	2·2	5	2·6	2	2·0	—	N 80° W	1·9
4·5	3	3·0	—	—	3	4·0	2	2·5	6	2·3	1	1·0	2	N 77 W	0·8
2·4	5	3·8	2	2·5	3	2·3	3	2·3	1	1·0	3	4·0	1	SW	1·2
8·0	—	—	6	2·2	4	2·2	1	5·0	2	2·0	3	3·0	3	N 64 W	0·9
3·5	3	3·7	1	3·0	11	3·1	2	3·5	3	3·7	2	3·0	1	N 79 W	1·9
—	1	2·0	10	3·7	3	3·7	2	4·5	3	3·3	—	—	1	W	1·9
5·0	2	3·0	7	2·6	13	1·8	2	2·0	—	—	1	2·0	—	S 73 W	1·5
3·0	3	3·0	—	—	9	3·0	1	5·0	1	7·0	—	—	—	S 70 W	0·9
—	2	4·5	2	1·5	7	2·6	1	4·0	—	—	2	2·0	—	N 54 W	0·5
—	1	1·0	1	1·0	6	3·0	3	2·3	3	2·3	1	3·0	1	N 11 W	1·0
4·0	2	3·5	2	6·5	6	2·2	1	7·0	2	1·5	—	—	—	S 58 W	0·9
—	5	3·2	2	5·5	4	2·7	1	6·0	2	4·0	—	—	—	N 78 W	0·7
2·7	2	3·5	6	2·7	12	2·4	1	7·0	1	3·0	—	—	1	S 72 W	1·9
3·4	2·5	3·2	3·2	3·1	7·1	2·6	1·8	3·4	2·2	2·8	1·2	2·7	0·8	S 87 W	1·1

least. No instance of a resultant wind from eastward has occurred in August. The average weather conditions are identical for July and August, and only slightly less favourable for June.

General Remark. – To affirm that future months and seasons will not reproduce like phases of the phenomena which those discussed in these papers have exhibited, would be to deny any utility whatever to these statistics. That there is a wide margin for variability is certain; nevertheless, useful probabilities for each month may be based upon such averages. Moreover, it is not improbable that the future of meteorology will enable man to foresee at least some of the phenomena with more precision than the rest; and then the correlation found to exist between the different meteorological elements will enable him to make use of such statistical tables to foretell with some approach to accuracy the general conditions of weather during a month or season. For instance, if the mean pressure, temperature, rainfall, prevalent wind or weather, any one of them, could be known beforehand, as to whether it would be below, at, or above the mean, we should be able to forecast the others pretty accurately. Such a foreknowledge of relative fine or overcast, rainy or dry weather, would be of especial service in relation to agricultural operations, the prospects of crops ripening, of good or bad harvests of cereals and fruits. Its relation to hygiene and mortality would also be valuable, enabling the medical meteorologist to foresee the prevalence of diseases or epidemics peculiar to certain conditions of weather. Both in connection with the animal and the vegetable kingdom the statistics of weather ought to be much more studied than they have hitherto been, in order to derive practical knowledge of favourable conditions, and indications which can be turned to useful account in providing preventive and remedial measures against unfavourable conditions of weather.

The curves of the monthly means of these thirteen years' observations are given on Plate IV. I have also added, at the suggestion of Captain Toynbee, wind diagrams for each month, giving the total number of observations for directions, with the mean force, by Beaufort scale, for each direction.

DISCUSSION.

THE PRESIDENT said that it was most desirable that some further systematic examination of the climate of London since the time of Luke Howard should be entered upon.

MR. SYMONS agreed with the President that it was very desirable to obtain an accurate history of the climate of London, and the changes it has undergone. He was of opinion that records of observations for nearly two centuries exist; but the index errors of the instruments not being known, it is doubtful how far they would repay discussion and publication, which would be a very heavy and expensive matter, for it must be remembered that Luke Howard published daily observations, and it was a continuous chronicle which was required, and this would require a volume of some 500 pages of tables.

Mr. STRACHAN said he had avoided using the word 'climate.' He considered climate to be mainly concerned with temperature, and no one would expect the same results from temperature observations carried out in different parts of

London. No doubt the city was warmer somewhat than the surrounding boroughs, and those again than the suburbs, or what might be termed the suburban villages. About these nice discriminations of temperature, which gave a trifling variation to the climate of London, he was not desirous of provoking discussion. He thought, however, the term 'weather' fairly included all his observations; and weather, as distinguished by winds, rain, the aspect of the sky and the barometer, was much the same all over London at the same time. Plant a thousand barometers in and around London; if they are correct, when reduced to the same level, they will at the same instant all read alike. The most violent storm would give no barometric difference over such a comparatively limited area. He considered weather must be generally the same over London, and hence he thought his tables for this subject applied to London generally. It would be seen by the tables that he gave the monthly mean maximum and minimum temperatures, and the mean temperature at 9 a.m., without any correction for diurnal range, or in fact for instrumental errors, since they did not exceed two or three tenths of a degree. In reply to Captain Toynbee, he had not stated that the weather for the month could be forecast; what he had stated was, that if we could know what the mean monthly value of one of the elements of weather would be, we could give a good guess at what the others would be. If Captain Toynbee would tell him what the mean height of the barometer would be, say next August, he would give him a forecast for the mean values of the other elements; but, if it turned out quite wrong, it must not be condemned unless the barometric value proved to be fairly correct. If the assumption and the forecast were satisfactory, there would be confirmation of the assertion made in the paper. If both were unsatisfactory, nothing could be said for or against it. If one were right, and the other decidedly wrong, the assertion would be worthless.

THE PRESIDENT agreed in the main with what Mr. Symons had said; but he urged the example of Mr. Strachan as an indication of what might be accomplished, even under the difficulties of the case. He considered that if a very few other Fellows had made similar approximate contributions for other periods of similar duration, a most admirable first step towards a more exhaustive examination of the climate of London would have been made. What the general public in London wanted to know in winter time was, when, and for how long, they might look for a frost; at what periods the temperature may be expected to keep below freezing, and at what periods to rise above it, in the day; when snow may be looked for; how many open and genial days may be anticipated; and when the unwelcome east wind may be expected to begin to blow, and how long it may be expected to prevail.

Dr. TRIPE said that some years ago the Metropolitan Medical Officers of Health started a publication of the sickness in different districts of the metropolis, and the average climate of London. Observations were taken at various localities, which were compared with those taken at Greenwich. This did not continue long, as the expense of publishing the returns of sickness and the meteorological observations was £600 a year. He found that in the middle of London the maximum was lower and the minimum higher than at Greenwich, the mean temperature being nearly the same, but the moisture was less.

Major HOTCHKISS said that photo-lithography was very extensively used in America for printing tables, &c., as it was considerably cheaper than ordinary printing, and did not require corrections in the proofs. A friend of his had recently had four pages of tables, note-paper size, photo-lithographed, and the cost for 100 copies was 10s. 100,000 copies of maps (1,000 each of 100 different maps 10 in. by 8 in.) only cost £200.

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

JANUARY 20th, 1875.

Ordinary and Annual General Meetings.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

JAMES ADAMS, M.D., Barnes, S.W.;
ALEXANDER RICHARDSON BINNIE, F.G.S., Town Hall, Bradford;
THOMAS B. BOTT, M.D., Bury, Lancashire;
JOHN M. FOX, M.R.C.S., Armaside, Cockermouth;
WILLIAM C. LAKE, M.D., West Cliff Terrace, Teignmouth;
JOHN LEIGH, M.R.C.S., Llanfabon Cottage, Pontypridd;
JOHN LIVY, M.D., Bolton;
JOHN MITCHELL, M.D., Barnard Castle, near Darlington;
CAPT. JAMES WILLIAM NEWTON, 220 Westgate Road, Newcastle-on-Tyne;
Rear-Admiral MATTHEW S. NOLLOTH, 13 North Terrace, Camberwell, S.E.;
REV. JAMES DUNNE PARKER, LL.D., The Vicarage, Hawes, Bedale;
Major-Gen. RICHARD STRACHEY, F.R.S., Clapham Common, S.W.;
REV. E. J. STUTTER, O.S.B., St. Augustine's, Ramsgate;
GEORGE TURNER, L.R.C.P., St. Ann's, Grove Road, Southsea, Portsmouth;
J. WEST WALKER, M.B., Spilsby;
JOHN WILLIAMS, M.D., Trosnant Lodge, Pontypool;
J. MITCHELL WILSON, M.B., Chatteris; and
HENRY JOHN YELD, M.D., 17 Argyle Square, Sunderland,
were balloted for and duly elected Fellows of the Society.

The names of six candidates for admission into the Society were read.

The PRESIDENT then declared the Ordinary Meeting closed, and announced that the Annual General Meeting had commenced.

Mr. J. S. HARDING and Mr. PASTORELLI were appointed Scrutineers of the Ballot for Officers and Council.

Dr. TRIPE read the Report of the Council and the Financial Statement for the past year (p. 310).

It was proposed by Mr. J. P. HARRISON, seconded by the Hon. F. A. R. RUSSELL, and resolved:—"That the Report just read be received and adopted, and circulated among the Fellows."

The PRESIDENT then delivered his Address (p. 297).

It was proposed by Mr. BROOKE, seconded by Mr. LAUGHTON and resolved:— "That the best thanks of the Society be given to the President for his very able and comprehensive Address, and the uniform ability and courtesy displayed by him in the chair, and that he be requested to allow his Address to be printed in the Society's Journal."

It was proposed by Mr. BREWIN, seconded by Capt. TOYNBEE, and resolved:— "That the cordial and best thanks of the Meteorological Society be communicated to the Council of the Institution of Civil Engineers for having granted the Society free permission to hold their meetings in the rooms of the Institution."

It was proposed by Mr. WHIPPLE, seconded by Mr. BRIGGS, and resolved:— "That the thanks of the Society be given to the Officers and other members of the Council, and to the Auditors for their services during the year."

It was proposed by Mr. BEARDMORE, seconded by Mr. GLYDE, and resolved:— "That the thanks of the Society be given to the Standing Committees, and that

they be requested to continue to discharge their duties until the next Council Meeting."

The PRESIDENT then announced the result of the ballot, and declared the following gentlemen to be the Officers and Council for the ensuing year :—

President.

ROBERT JAMES MANN, M.D., F.R.A.S.

Vice-Presidents.

CHARLES BROOKE, M.A., F.R.S., F.R.C.S.
HENRY STORKS EATON, M.A.
ROGERS FIELD, B.A., Assoc. Inst. C.E.
Captain HENRY TOYNBEE, F.R.A.S.

Treasurer.

HENRY PERIGAL, F.R.A.S.

Trustees.

SIR ANTONIO BRADY, F.G.S.
STEPHEN WILLIAM SILVER, F.R.G.S.

Secretaries.

GEORGE JAMES SYMONS.
JOHN W. TRIPE, M.D.

Foreign Secretary.

ROBERT H. SCOTT, M.A., F.R.S.

Council.

PERCY BICKNELL.
CHARLES O. F. CATOR, M.A.
CORNELIUS BENJAMIN FOX, M.D.
FREDERIC GASTER.
WILLIAM JOHN HARRIS, M.R.C.S.
JAMES PARK HARRISON, M.A.
JOHN KNOX LAUGHTON, M.A., F.R.A.S.
ROBERT J. LECKY, F.R.A.S.
WILLIAM CARPENTER NASH.
Rev. STEPHEN J. PERRY, M.A., F.R.S.
WILLIAM SOWERBY, F.L.S.
E. O. WILDMAN WHITEHOUSE, F.R.A.S., Assoc. Inst. C.E.

The Meeting then terminated.

FEBRUARY 17th, 1875.

Ordinary Meeting.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

WILLIAM ARNOLD, Lichfield Street, Tamworth ;
H. N. DAVIES, L.R.C.P., Glyn Rhondda House, Cymer, Pontypridd ;
JOHN MAULE SUTTON, M.D., 244 Great Clowes Street, Manchester ;
GEORGE SPEARS THOMSON, M.D., 4 Worcester Lawn, Clifton, Bristol ;
Prof. F. VAN RYSSELBERGHE, Ecole de Navigation, Ostend, Belgium ; and
J. BURDWOOD WATSON, L.F.P.S., Bourne,
were balloted for and duly elected Fellows of the Society.

The names of two Candidates for admission into the Society were read.

The following communications were then read :—

"Report of the Conference on the Registration of Phenological Phenomena." (p. 332.)

"On the Weather of Thirteen Summers." By R. STRACHAN, F.M.S. (p. 351.)

"On a universal system of Meteorography." By Prof. F. VAN RYSSELBERGHE.*

The Meeting was then adjourned.

* This paper will be printed in the next number of the Quarterly Journal.

DONATIONS RECEIVED FROM JANUARY 1ST TO MARCH 31ST, 1875.

Presented by Societies, Institutions, &c.

Brussels	Observatoire Royal	Annales, January and February.
Copenhagen	Danske Meteorologiske Institut	Bulletin Météorologique du Nord, December 1, 1874, to February 28, 1875. By Captain N. Hoffmeyer, Director.
Cracow	K. K. Sternwarte	Meteorologische Beobachtungen, November 1874 to January 1875. Dr. F. Karlinski, Director.
Edinburgh	Royal Society	Proceedings, Vol. vii., Nos. 87-89.
Fiume	I. R. Accademia di Marina	Meteorological Observations, October to December 1874.
Geneva	Société de Géographie	Le Globe, tome ix., livraison 6.
Greenwich	Royal Observatory	Results of Magnetical and Meteorological Observations, 1872. By Sir G. B. Airy, K.C.B., Astronomer Royal.
Klagenfurt	Sternwarte	Meteorologische Beobachtungen, November and December 1874.
Liverpool	Literary and Philosophical Society	Proceedings, 1873-74. No. xxviii.
London	Art Union	Report of the Council for the year 1874.
	General Register Office	Weekly Return of Births and Deaths, 1874, No. 52; 1875, Nos. 1-11.
	" "	Quarterly Returns of Marriages, Births and Deaths, 1874, December 31st. By the Registrar-General.
	Meteorological Office	Daily Weather Reports and Charts.
	" "	Hourly Readings from the self-recording Instruments at the Seven Observatories in connection with the Meteorological Office, July to September, 1874.
	" "	Daily Bulletin of Weather Reports, Signal Service, U.S.A., with the Synopses, Probabilities and Facts, October and November 1872.
	" "	Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. By the Meteorological Committee.
	Royal Astronomical Society	Memoirs, Vol. xl.
	Royal Society	Proceedings, Nos. 157-159.
	Society of Arts	Journal, No. 1164.
Manchester	Literary and Philosophical Society	Proceedings, Vol. xiv., Nos. 6-9.
Melbourne	Observatory	Monthly Record of Results of Observations in Meteorology, Terrestrial Magnetism, &c. July and August, 1874. By R. Ellery, F.R.S., Government Astronomer.
Moncalieri	Osservatorio del R. Collegio Carlo Alberto	Bulletino Meteorologico, Vol. ix., Nos. 3-6, March to June, 1874. By Padre F. Denza, Director.
Oxford	Radcliffe Observatory	Results of Meteorological Observations, 1872. By Rev. R. Main, F.R.S., Radcliffe Observer.

Paris..........	Observatoire de Montsouris	Bulletin Mensuel, Nos. 20, 22, 36-38.
	" "	Annuaire Météorologique et Agricole, 1875. By M. Marié Davy, Director.
	Observatoire National ..	Bulletin International. By M U. J. Le Verrier, Director.
	Société Météorologique de France	Nouvelles Météorologiques, January and March.
Rome	Osservatorio del Collegio Romano	Bulletino Meteorologico, November 1874 to February 1875. By Padre A. Secchi, Director.
Sydney	Government Observatory	Meteorological Observations, July and August, 1874. By H. C. Russell, B.A., Government Astronomer.
Toronto	Education Office	Journal of Education, January and February. By Rev. E. Ryerson, D.D., Superintendent.
Upsala.........	Observatoire de l'Université	Bulletin Météorologique Mensuel, Vol. vi. Nos. 6-9, June to September, 1874. By H. H. Hildebrandsson, Director.
Vienna	K. K. Centralanstalt für Meteorologie und Erdmagnetismus	Beobachtungen, November 1874 to January 1875. By Dr. C. Jelinek, Director.
	Oesterreichische Gesellschaft für Meteorologie	Zeitschrift, Band ix. No. 24; Band x. Nos. 1-6.
Wellington....	Registrar-General's Office	Statistics of the Colony of New Zealand for the year 1873. By the Registrar-General.

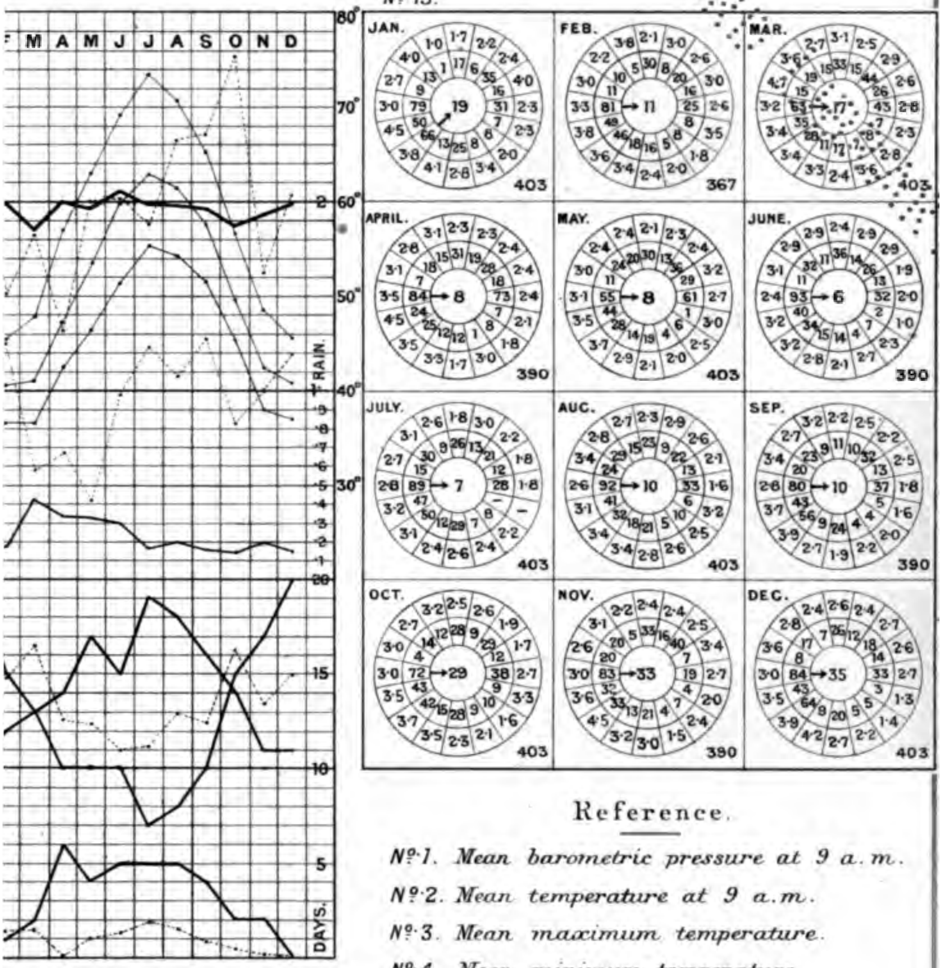
Presented by Individuals.

Borius, Dr. A.	Recherches sur le climat du Sénégal, par A. Borius.
Curtis, John	Meteorological Summary for Manchester, 1874.
Dunlop, W. H.	Results of Meteorological Observations made at Annanhill, Kilmarnock, Ayr, January 1874 to January 1875.
"	Abstract of ditto for the year 1874.
Dymond, W. P...........	Meteorology of West Cornwall and Scilly 1870 to 1874, and Observations of Sea Temperature, 1872 to 1874. By W. P. Dymond.
Estourgies, L.	Les Courants de la Mer et de l'Atmosphère, par Dr. Buys Ballot, traduit du Néerlandais par L. Estourgies.
Ffolkes, Rev. H.	Summary of Meteorological Register at Hillington, 1874.
Forbes, A.	Meteorological Summary, Culloden, November 1874 to February 1875. (MS.)
Fritsch, Dr. Karl	Normaler Blüthen-Kalender von Oesterreich-Ungarn, reducirt auf Wien, von Karl Fritsch. iii. Theil.
Hann, Dr. J.	Bericht über die Fortschritte der geographischen Meteorologie.
Higgs, Rev. W., LL.D. ..	'The Telegraphic Journal and Electrical Review.' Nos. 46-51.
Hildebrandsson, H. H.....	Essai sur les courants supérieurs de l'Atmosphère dans leur relation aux lignes isobarométriques. Par H. Hildebrand Hildebrandsson.
Hoskins, S. E., M.D., F.R.S.	Meteorological Observations taken at Guernsey, December 1874 to February 1875.
Loomis, E...............	Results derived from an examination of the U.S. Weather Maps for 1872 and 1873. Second Paper. By Elias Loomis.
Mann, R. J., M.D., F.R.A.S.	Cartes synoptiques journalières, Janvier et Février 1874, construites par N. Hoffmeyer, Directeur de l'Institut Météorologique Danois.

Merrifield, J. LL.D., F.R.A.S.	Meteorological Summary, Plymouth, 1874.
Miller, S. H., F.R.A.S. ..	'The Fenland Meteorological Circular and Weather Report,' January to March.
Munn, A.	Ozone Observations taken at Harbour Grace, Newfoundland, October to December 1874. (M.S.).
Murray, A. E.	Meteorological Journal, January 1730 to October 1733, kept in all probability by Dr. Frewen, at Northiam, Sussex. (M.S.).
Nelson, R. J.	Summary of Meteorological Observations taken in Kendal for 1874.
Plantamour, Prof. E.	Du Climat de Genève, par E. Plantamour.
Prince, C. L., F.R.A.S. ..	The Summary of a Meteorological Journal, kept by C. L. Prince, F.R.A.S., at his Observatory, Crowborough Beacon, Sussex, 1874.
Purser, E., M.A.	Meteorological Tables of Smyrna for the years 1864 to 1874.
Quetelet, E.	Quelques Nombres caractéristiques relatifs à la température de Bruxelles; note de M. Ern. Quetelet.
Scott, W.	Summary of Meteorological Observations made at Barlaston, Staffordshire, in the year 1874. (M.S.).
Silver, S. W.	'The Colonies,' Nos. 178-182.
Symons, G. J.	Symons's Monthly Meteorological Magazine, January to March.
"	Handy Book of Meteorology. By A. Buchan, M.A., 2nd edition.
"	Physical and Medical Climate and Meteorology of the West Coast of Africa, with valuable hints to Europeans for the preservation of health in the Tropics. By J. A. B. Horton, M.D.
"	Fr. Baconi de Verulamis Historia Naturalis et Experimentalis de Ventis, &c. (1662.)
"	Nice and its Climate; with notices of the coast from Marseilles to Genoa. By Edwin Lee.
"	Gerardi Simons, responsio ad quæstionem physicam, in Academia Rheno-Trajectina a Nobilissima Facultate Math. et Phil. Nat. propositam: "Aquæ, quæ vaporis formâ in Atmosphæra continetur, exponatur et constitutio et probabilis theoria." Quæ premium reportavit (1823).
"	Resultats des Observations Météorologiques faites à Utrecht pendant l'année 1839. Par M. Van Rees.
"	Het Beginsel van de Wet der Stormen. Naar het Engelsch van J. Sedgwick. Met eene voorrede van Dr. C. H. D. Buys Ballot.
Tarbotton, M. O., F.G.S. ..	Meteorological Observations taken at Nottingham, 1874.
" " ..	Register of Rainfall collected at Nottingham from January 1 to December, 31. 1874.
The Editor..............	'Nature,' Nos. 270-282.
"	'Public Health,' Vol. iii., No. 12, March 25.
"	'The Scientific, Artistic, and Literary Societies' Directory' for 1875.
"	'The Medical Inquirer,' No. 1.
Toynbee, Capt. H., F.R.A.S.	On the normal circulation and weight of the Atmosphere in the North and South Atlantic Oceans, so far as it can be proved by a steady meteorological registration during five voyages to India. By Capt. Henry Toynbee.
Wheatstone, Sir C., F.R.S.	Observations in Magnetism and Meteorology, made at Makerstoun, in Scotland, in the Observatory of General Sir T. M. Brisbane in 1843. Discussed and edited by John Allen Broun.
" "	Observations of the Spots on the Sun from November 9th, 1853, to March 24th, 1861, made at Redhill. By Richard C. Carrington, F.R.S.
" "	Reports of the Superintendent of the U. S. Coast Survey showing the progress of the Survey during 1855, 1856, 1857.
Wilson, J. M., M.B.	Annual Report to the North Witchford Rural Sanitary Authority, for the year ending 31st December, 1874. By J. Mitchell Wilson, M.B., F.M.S.

URVES OF THE MONTHLY MEAN METEOROLOGICAL ELEMENTS FOR THIRTEEN YEARS AT LONDON: 1861 TO 1873.

Nº 13.



Reference.

Nº 1. *Mean barometric pressure at 9 a.m.*

Nº 2. *Mean temperature at 9 a.m.*

Nº 3. *Mean maximum temperature.*

Nº 4. *Mean minimum temperature.*

5. *Mean monthly rain-fall (of twelve years 1862 to 1873).*

6. *Monthly resultant direction of winds observed at 9 a.m.*

7. *Resultant force of ditto (base line same as for rain Nº 5.).*

Nº 8. *Mean number of days on which rain fell.*

Nº 9. *Mean number of clear days.*

Nº 10. *Dº. Dº. fair . .*

Nº 11. *Dº. Dº. dull . .*

Nº 12. *Curve of frequency of thunderstorms.*

3. *Wind Diagram.— The inner circle gives the number of calms; the inner annulus, the number of observations under the sixteen directions; and the outer annulus the mean force by Beaufort's scale, the total number of observations is shown in the lower right hand corner of the square for each month. The arrow head marks the direction whence came the most air, or the greatest product of force multiplied by the number of observations for direction.*

QUARTERLY JOURNAL

OF

THE METEOROLOGICAL SOCIETY.

VOL. II. No. 15.

XXXII. *On a Universal System of Meteorography.* By Prof. F. VAN RYSSELBERGHE.

[Received January 15th. Read February 17th, 1875.]

AT a meeting of the Royal Academy of Sciences of Belgium, held in August 1873, a paper was read on a new system of Meteorography, for the testing of which a trial apparatus has been in operation for two years at Ostend. This communication met with a very flattering reception, and the two members charged with examining the merits of the invention reported most favourably thereon. General Liagre, successor to the late M. A. Quetelet as Perpetual Secretary of the Academy, spoke of it in these terms:—

"Prof. Van Rysselberghe has invented an apparatus that is at once simple, "accurate, very ingenious, and comparatively cheap, by means of which the "indications of a great number of meteorological instruments of any kind "can be registered, whether they be placed near to or far from the registering "apparatus. I do not hesitate to say that the invention of Prof. Van "Rysselberghe deserves not only the approbation of the Academy, but also "the encouragement of the Government."

M. Gloesener, Professor at the University of Liège, and first reporter, said: "On my return from the mission which the Government had charged "me with at the Vienna International Meteorological Congress, I went to "Ostend, where I stayed several days, on purpose to study minutely the "system of Prof. Van Rysselberghe. The inspection of the working of the "apparatus, admirable for its simplicity and precision, and the experiments "made, convinced me that it is capable of registering, with great exactitude, "the indications of any instrument working by index or by mercury, even

"where the indicating instrument is far removed from the registering one; "so that the readings of meteorological instruments at different distant "stations might be made and collected at a central observatory. The "principal feature in this instrument, and which distinguishes it from all "others hitherto constructed, is that it engraves automatically on metal the "meteorographical curves, thus furnishing a plate, graduated by the appara- "tus itself, from which as many copies as desired may be struck off; thereby "affording, to observers adopting this system, the means of communicating "reciprocally their documents with the greatest facility. Another remarkable "fact is, that a single burin, put in motion by a simple electro-magnet, can "engrave successively, on one and the same metallic plate, the elements of "all the curves. The indicating apparatus and the clock are left free to "themselves; no work is required of them, all the mechanical movements "being produced partly by electro-magnetism, partly by a spring mover, "wound up from time to time. In short, I am bound to declare, and I do "so with pleasure, that I have found in Prof. Van Rysselberghe's Meteoro- "graph a truly universal register, and one in every respect worthy of attracting "the attention of meteorologists and directors of observatories."

The Belgian Government has granted me a liberal subsidy for the installation of a definitive and complete apparatus, intended to register on the self-same plate the indications of the barometer, psychrometer, hygrometer, Robinson's anemometer, the vane, pluviometer, and tide-gauge,—this last instrument being placed far from the recorder. Perhaps the following description of this Universal Meteorograph will be read with interest by the Fellows of the Meteorological Society.

A vertical cylinder, *C* (Plate V. fig. 1), controlled by clockwork, makes, by intermission, but at equal intervals, a revolution round its axis, *i.e.*, if the meteorograph is intended to register every ten minutes, the clockwork is combined in such a manner that, on the stroke of the hour, the cylinder starts at a slow and regular motion, takes a minute to complete a single revolution, and then stops, and remains stationary during the nine following minutes. At the tenth, the clockwork starts again, and the cylinder makes another revolution – and so on. In the front of the cylinder an electro-magnet, *E*, is supported by a vertical screw, *V*, and its armature is provided with a burin, *B*. As long as the cylinder is stationary, no current passes through the magnet, and the point of the burin is kept at a small distance from the cylinder. But, when the latter moves, the voltaic circuit of the magnet, connected with the instrument to be registered, becomes closed at a variable moment, according to the variations of the indicating instrument. Then the magnet pushes the burin against the surface of the cylinder, and, perpendicularly to the generants, a line begins to be traced; its length will be proportional to the indication of the observed instrument. After each revolution of the cylinder, the burin makes a slight descent (because the screw, *V*, turns a little); so that after a series of revolutions, we obtain a series of equi-distant lines, but not of equal length, the extremities of which form the curves of observations.

The receiving cylinder is covered with a thin plate of copper, coated with etching-varnish. When this plate has received the inscriptions of the burin, it is taken off and plunged into aqua-fortis; it thus becomes an engraved plate, from which copies may be taken off at will.

Suppose it be required to register the variations of the height of a mercurial column (syphon-barometer, open-stem thermometers, &c.). A dipping-rod, S, is suspended over the mercurial level, and, by means of any mechanical contrivance, the rotatory motion of the cylinder can give to the dip a rectilinear one towards the mercurial meniscus. For instance, the axis of the cylinder can be provided at its lower part with a cogged sector, A, tangential to which a cogged pulley, $M_3 N$, can be placed. Then, the dipping-rod being suspended by a steel wire or chain, which passes over the groove of the pulley, we shall connect one pole of the battery to the dip, the other to the mercury, the bobbins of the magnet E being a part of the circuit. Now, if the cylinder and its cogged sector A execute a full turn, the latter meeting the pinion M_3, the dipping-rod S descends towards the mercury, and, at the instant of contact, the voltaic circuit being closed, the burin begins to engrave a line, the length of which depends on the height of the mercurial level. For, if the level is high, the dip and the mercury soon meet each other, and the line is long; if the level is lower, the meeting occurs later, and the line is short, because every line is cut off at a fixed place, corresponding to the zero of the scale, which we shall see later on. First we must notice that the pinion, M_3, after it has been in gear with the sector A, becomes free when the latter turns away; then, going back by the traction of any spring or counterpoise, it brings the dipping-rod again to its starting position. Secondly, at the completion of each revolution, the cogged sector A works into the pinion H of the screw V. The latter passes a nut to which the electro-magnet is attached, so that, at the end of each revolution, the engraving system makes a slight descent parallel to the generants of the cylinder, and the burin is disposed for engraving, at the next revolution, a following line, below the preceding ones.

At first sight, this very simple contrivance seems to be devised by reversing Sir C. Wheatstone's principle, which has been successively adopted by Padre Secchi and also by Dr. Theorell; but, in fact, the new meteorograph has over all others the most important advantages.

I.—Instruments constructed on Wheatstone's principle fail for this reason, viz. the dip, on retiring from the mercury, produces at the moment of its emersion a spark of separation (*étincelle de rupture*), which, oxidising the meniscus, soon puts the instrument out of order. It is true that Dr. Theorell has constructed for the Stockholm, Upsala, and Vienna observatories, instruments for recording the indications of the barometer and psychrometer whereby this inconvenience is avoided by cutting off the current at the moment of contact and simultaneously arresting the dip; but this result requires the addition of a very complicated mechanism, the apparatus is expensive (£480), and only registers atmospheric pressure and the indications of the psychrometer, and even for this it requires three separate telegraphs.

I obtain the same result in a very simple manner. A wooden disc, D, concentric with, and fixed on the lower part of, the axis of the cylinder, is incrusted with a fragment of a metallic limb $a\ b$, and sustains two metallic touches $F_1\ F_2$, the insulation of which makes a discontinuity in the voltaic circuit, the current being enabled to pass only when the touches are on the limb. Further, the latter is so placed, and of such length, that the touches meet its beginning at the very moment the cogged sector A catches the pinion M_3, but quits the limb, thus cutting off the circuit, a little before the pinion becomes free, consequently before the dip emerges. The spark at separation will no longer take place between the dipping-rod and the mercury, but between the touches and the extremity of the limb, where its effect is perfectly innocuous. Moreover, when the current is cut off, the burin stops the engraving; and since at each revolution of the cylinder this interruption of the current occurs at a fixed instant, the extremities of the engraved lines succeed each other in a straight line, a generant of the cylinder which determines the zero of the scale and confirms at every time the absolute accuracy of this registering method. In fact, the reiterate inscription of a fixed point ought to give a straight line; and as this is really produced with remarkable precision, we may conclude that the inscription of the variable points is executed with equal exactitude.

One might be induced to think that it is a matter of indifference whether the indicating mercurial surface communicates with this or that pole of the battery, provided that the dipping-rod is connected with the opposite one; but this is not the case. It is of the highest importance to connect the mercury with the negative pole; otherwise, notwithstanding that the spark at separation is avoided, the meniscus would become more or less oxidised after a certain lapse of time. On the contrary, in choosing the negative pole, all trace of oxidisation is removed. These effects may perhaps be attributed to electrolysis of the humidity contained in the air. However that may be, the meniscus of the barometer which furnishes the indications at Ostend, and which has been in use for two years, is still as brilliant as on the first day.

II.—The registering of the indications of the dry and wet bulb thermometers is made by the method adopted for the syphon barometer, and a mechanical contrivance of great simplicity arrests the dipping-rod at the instant it comes into contact with the mercurial column; the latter, therefore, cannot become broken. The axis of the cogged pulley which holds the suspension-wire of the dip is fixed on the armature of an electro-magnet, and, in its normal position, it is in the same plane with the sector A. But at the instant the dip comes into contact with the mercury, the current passes not only through the bobbins of the burin, but further through the last-mentioned electro, which, disengaging the pulley, brings it stationary against a rough surface, till the current being cut off at a, the lever is set free, and the pulley returns to its starting position.

If Saussure's hygrometer were employed, means might be adopted which, while rendering the instrument fit for registering, would, at the same time, make it more sensitive and exact than hygrometers of this kind generally are,

such as are constructed for direct observation. In fact, we might do away with the index, which is difficult to balance properly, and the excess of weight of which, on one side or the other, falsifies its indications; the pulley on which the hair turns might also be dispensed with, for it spoils the hair, and its axis introduces a friction detrimental to the accuracy of the apparatus. Instead of that, the hair *A B* (fig. 5), suspended freely to an adjusting screw, is provided at its extremity with a platinum point, serving as tension-weight, and in communication with the positive pole of the battery. The other pole is connected with the mercury in the gauge *D*, into which an iron cylinder, suspended by a metallic chain attached to a cogged pulley, is plunged. When this pulley, working with the sector *A*, turns, the iron cylinder sinks into the mercury, and slowly raising the level of the liquid, brings it into contact with the extremity of the point which terminates the hair. At this moment, the telegraphic circuit being closed, a line is graven on the cylinder, the length of which varies in proportion to the variations in the length of the hair.

III.—The method above expounded is general, and, as well as to register the fluctuations of any level, it can be applied to record the indications of any needle, hand or index.

For instance, let *A* (fig 2) be the index of the counter of a Robinson's anemometer, the wheels of the counter being so adapted that the index, which always advances in proportion to the distance run by the wind, should never, even with the highest known winds, perform a complete turn during the interval of two succeeding records. This index, which is not immoveably fixed on, but slips round its axis when compelled, is connected with one of the poles of the battery, while the other communicates with a point, *B*, fixed on a pinion M_2, and which we shall call " the observer." The pinion must be laid concentrically to the axis of the index, and tangential to the cogged sector *A*. It appears that at every revolution of the cylinder " the observer" *B* comes and meets the index, and, while bringing it back each time to zero, causes, at the moment of meeting, the closing of the voltaic circuit, and consequently the commencement of the engraving on the cylinder of a line, the length of which is in proportion to the angular displacement of the index since the last observation.

In like manner, we might register the indications of any instrument, the index or needle of which, being liable to be displaced momentarily by the " observer," could resume its normal position upon the return of the " observer" to its starting point. (The galvanometer and magnetic-bars belong to this class.) But if it were required to register the variations of a metallic thermometer or of an aneroid barometer, it would be necessary to modify the foregoing system, for the indices of those instruments could not yield to " the observer" when this should happen to meet them. In these cases we should be obliged to have recourse to an "observing hand," *C B* (fig. 4), concentrical to the indicating one *A*, but electrically insulated from it and communicating with one of the poles of the battery, whereas the indicating hand should be in connection with the other. In addition to this, a light spring, *C*, should constantly incline the " observing hand" against a

stay, B, borne by a pinion, M_4, which must be concentrical to the common axis of the hands, and tangential to the cogged sector A. As the latter turns and comes into gear with the pinion, the "observing hand" would approach, meet, and touch the indicating one, and at this moment a line would begin to be traced on the receiving cylinder. In the mean time the hands would remain in contact one with the other, and the stay, B, in pursuing its course, would pass under the indicating one without disturbing it; but when the pinion would become free and turn back, the stay would pick up the "observing hand" and bring it home.

The direction of the wind can also be registered in an extremely simple manner. Concentrically to a prolongation of the axis of the vane, and tangential to the cogged sector A, a pinion, M_1 (fig. 3), is fitted, bearing a metallic touch, E, connected to the positive pole of the battery, and which we shall call "the observer." The prolongation of the axis of the vane, connected with the negative pole, is provided with an insulating ring; but a small metallic index is joined to the axis in the direction of the arrow of the vane. When the sector A catches the pinion M_1 (the circumference of which is equal to the arc of the sector), the extremity of the touch E runs over the axis, and at the moment it passes upon the index, the voltaic circuit closes for an instant, while a small trait is engraved on the receiver, and indicates by its position the exact direction of the wind.

IV.—In short, the indications of every meteorological instrument (we have just reviewed the principal types) are susceptible of being registered by one uniform method, and it is possible to have a single register only for a great number of instruments, thus avoiding the expense of a special register for each one. In fact, if the pinions M_1, M_2, M_3,......are disposed all round the single receiving cylinder C, and tangential to the single sector A, and if a system of touches similar to F_1, F_2, is fitted for each instrument to be recorded, then, at each revolution of the cylinder, the pinions come successively in and out of gear with the sector, each in its turn; while the touches put the corresponding instrument successively in and out of communication with the single battery. So that, at each revolution, the single burin engraves as many succeeding lines as there are indicating instruments. The meteorograph constructed by M. Schubart, of Ghent, for the new Ostend Observatory, gives, at every quarter of an hour, the indications of syphon-barometer, wet and dry bulb thermometers, Saussure's hygrometer, Robinson's anemometer, vane, rain-gauge, and the height of the sea-level in Ostend harbour, because the above expounded method is enabled to give the records of several instruments placed at a great distance from the recorder. Let us refer to figs. 1, 2, and 3, and leave on the same table the receiving cylinder, with its cogged sector A, but remove and place on another table one of the pinions, M, with the corresponding instrument. If, at the instants when the cylinder moves, an isochronous motion could be imported to its sector A, and the removed pinion, the recording would take place just as if these two organs were in direct connection. It would be rash to expect that two

movers would keep perfectly synchronous during a long time, but it is possible, and even easy to render them so by intermission, and for a few seconds only: electric watches and dial telegraphs resolve this problem in quite a sufficient manner, but Mr. Hughes's and Mr. Meyer's telegraphs realise more perfect synchronism.

V.—The meteorographic system which we have just described presents the particularity of permitting the scales of the curves to be enlarged or reduced at pleasure, without having to resort to multiplying levers, which always render instruments sluggish. In fact, we can give such diameters to the pinions, M_1, M_2......, that the scales of the different curves shall be in due proportion one with another; these proportions being once fixed upon, all the scales can be enlarged or reduced as desired, by simply varying the diameter of the receiving cylinder. And, moreover, if the scales are engraved on the limb *a b*, and the divisions filled up with an insulating mastic, the current undergoes a short interruption each time that the touch F_2 passes over a division, and the diagrams come out quite divided; they combine, also, the advantages both of the graphic and tabular method.

VI.—It might be imagined that the metallic wires or chains which support the dipping-rods would become heated by the passage of the current, and thus endanger the exactitude. But it is not so; in the first place the current does not pass by the wires, it is communicated to the dipping-rods by special conductors; but even did the fluid pass by them, no inconvenience could arise, since the traits engraved on the cylinder commence at the moment of contact; that is to say, before the wires could have time to become heated; and, in the second place, their termination is altogether independent of the length of the wires.

As to the normal dilatation of these latter:—

1st.—In thermography it modifies but in a very small proportion the primitive scale of the thermometer, and it is easy to construct the modified scale.

2nd.—In the syphon-barometer this dilatation has a useful effect, since it contributes to the compensation. A syphon-barometer might be so constructed that the variations in the lower branch should be independent of the temperature; but the instrument would have to contain a very large quantity of mercury when a very large diameter is given to the vacuum chamber, much larger than that of the open branch, in order that the variations of the level in the latter might be almost as extensive as in Fortin's barometer. At all events, we can compensate the barometer in another manner: *UL*, *GQ* (fig. 6) are two strips of zinc united by a lever, *LG*. The strip *GQ* has a small pulley at its extremity, over which the wire or chain, supporting the dipping-rod, is passed. Indeed, the length of these strips and the position of the fulcrum of the lever (which is regulated by means of a micrometer screw) are determined in such a manner that, in consequence of the dilatations of the whole system, the dipping-rod descends or ascends in quantities equal to the variations which the changes of the temperature cause in the level of the

lower branch. For determining these variations the following formula is to be employed:—

$$\Delta h = \frac{c\beta_0 q - V_0(q - 3\epsilon)}{c + c^1} t.$$

In which Δh represents the variation of the level in the lower branch,

c the section of the vacuum chamber,

c^1 „ „ lower branch,

β_0 the height of the mercurial column at zero, which balances the atmospherical pressure,

V_0 the quantity of mercury in volume at zero contained in the instrument,

q the co-efficient of the absolute dilatation of the mercury,

3ϵ „ „ cubic „ of the tube,

and t the temperature.

In order to avoid the influence of capillarity, first of all a convenient diameter (10 millimetres at least) is to be given to the lower branch of the barometer; then, instead of letting the dipping-rod descend in line with the axis of the tube, it passes by the semi-radius, for the surface of the meniscus in that place gives, with sufficient precision, the corrected level.

DISCUSSION.

Mr. BROOKE remarked that the Apparatus of Professor Van Rysselberghe presented some important improvements over its predecessors. It is probably nearly 40 years since he first saw a similar apparatus constructed by Sir C. Wheatstone, in which, as in the present apparatus, a partially toothed wheel was employed to bring wires successively into contact with columns of mercury, by which voltaic circuits were closed, and indications obtained by means of electro-magnets. He had also observed similar arrangements in the apparatus of Padre Secchi, as seen in the Paris Exhibition of 1867. But in the present apparatus the observations were automatically etched on a plate of copper, from which any required number of perfectly accurate copies may be printed. The means of applying a temperature correction to the barometer by the expansion and contraction of a rod of zinc, and of diminishing the error due to capillary depression, appeared to him to be very ingenious.

Mr. SCOTT said that Mr. Whitehouse, who had been unable to remain for the discussion, had requested him to state, on his behalf, his admiration of the perfection of the various contrivances introduced by Prof. Van Rysselberghe in his meteorograph, and of the complete mastery of the electrical principles shown in the arrangements of the instrument. He (Mr. Scott) did not presume to offer any opinion on the subject himself, but he thought that the Society was to be congratulated on attracting foreign meteorologists to bring their valuable papers to its meetings. There was one great difference between Dr. Theorell's instrument, which he had seen at Upsala, and that now submitted to the Society, viz. that the Swedish physicist had caused his instrument to furnish actual printed numerical readings, at regular intervals, instead of graphical curves. This was, however, simply a question of mechanical arrangement.

Mr. SYMONS said that, among the many advantages which this instrument possessed, he considered the getting rid of the transcription of observations one of the greatest. It also possessed the immense advantage of transmitting a complete set of observations through only two wires. He preferred it to Theorell's instrument, as he considered diagrams appeal to the eye much better than a mass of figures. He thought this instrument would prove in many cases a great boon.

Mr. STRACHAN said the specimen which had been passed round the room showed the barometer curve so well, that he fancied even indications were given of the diurnal range. He should like to know how accurately the barometric

pressure could be read off from the paper, as compared with a standard reading. He could read it to half a millimetre, that is, to about ·02 inch; but, probably, there was also some error of registration. Then, as to the wind, he could not see how the direction could be got from the trace nearer than the cardinal points and their intermediaries. If so, that was not sufficiently good for direction.

Prof. VAN RYSSELBERGHE, in returning thanks to the President and Fellows for the flattering welcome given him, begged leave to remind them how important it sometimes is to invert a question, to overturn a principle. The ancients, judging from appearances, concluded that the sun and other celestial bodies revolved round the earth as their fixed centre; and Ptolemy, by this system, explained perfectly well the diurnal motion. But Copernicus asked himself if it were not the earth that turned on its axis, and this simple query led him to the discovery of the true constitution of the universe. Sir Charles Wheatstone was the first to apply electricity to meteorography, and this agent gave him the automatical impression in figures of the indications of the barometer and thermometer. Padre Secchi adapted the principle of Sir Charles to the registering of the pyschrometer; but the apparatus of both these eminent men failed in consequence of a serious obstacle, viz. the oxidation of the mercury by the electric spark. Dr. Theorell has obviated this inconvenience, but by a means at once complicated and very expensive. In fact, the principle of Sir Charles had, hitherto, only served to register the indications of mercurial instruments; and, for each indicating instrument, a special telegraph was always required. Now, what he (Prof. Van Rysselberghe) had done was simply owing to the happy idea he had had of reversing the principle. Instead of making a stylet move before a fixed cylinder, he caused the cylinder to move before a stationary stylet; and, by this means, all is rendered simple and easy; the principle becomes generalised, and the problem of meteorography definitely resolved. A simple burin engraves the whole, and an economy is thereby effected in the cost of construction, the advantage of which is in proportion to the greater number of instruments to be registered. In reply to those who wished to be informed as to the price of the apparatus, he stated that the cost varied from £100 to £200, according to the number of instruments to be recorded, the amplification desired to be given to the scales, and the frequency of the observations. Although he adopted the registering at intervals of ten minutes, yet the apparatus is fully capable of registering in a consecutive manner, and of giving, say every minute, the indications of ten instruments. Nevertheless, he thought that in meteorology a redundancy of documents ought to be avoided, and that it is preferable to condense, on the same sheet, the results of several days' observations, in order to grasp the whole of the phenomena and their reciprocal bearings. In answer to the remarks of Mr. Strachan, who considered that the present diagrams were very reduced, he observed that these diagrams had been obtained by a trial apparatus, and not by a definite one, on which the scales are greatly enlarged; so much so, that the naked eye can distinguish the tenth of a degree centigrade for temperature, and the tenth of a millimetre for atmospheric pressure. These approximations appeared to him sufficient for all practical purposes, but they are far from being the extreme limit of the precision of the apparatus, for the scales can be enlarged *ad libitum*, and without endangering the exactitude of the instrument; the same as a good microscope, which magnifies the outlines of an object without distorting them; and by this new method the magnetic variation can also be recorded with great precision. Let us admit 2 degrees to be the maximum range of the annual variation in declination. We might, if it were requisite, employ the whole of the circumference of the cylinder to describe these 2 degrees (=120 minutes). Now, with a radius of 10 centimetres, which would give a circumference of 628 millimetres, we have 5 millimetres to a minute; and, as the naked eye can very well estimate the fourth of a millimetre, these dimensions would suffice for the reading of the twentieth of a millimetre—3 seconds, or thereabouts. With twice this radius, the facility of the readings would be doubled, and so on, for there is no limit to this amplification, and the absolute precision would remain the same, it being that of the indicating instrument itself, such as is employed for direct observations.

NOTE, August 1875.—The Jury of the International Congress of the Geographical Sciences at Paris has awarded to Professor Van Rysselberghe for the instrument above described the highest recognition in its gift, the Diploma of Honour, usually reserved for Official Institutions. The only individuals who have received this distinction previously have been Livingstone, Lesseps and Francis Garnier.

XXXIII. *Results of Meteorological Observations made at Patras, Greece, during* 1873. By Rev. Herbert A. Boys. (Communicated by G. J. Symons, F.M.S.)

[Received January 19th. Read March 17th, 1875.]

I now send the result of another year's meteorological observations in Greece, made under more favourable circumstances, and with better and more numerous instruments than before.

I have constructed a wooden platform above the roof of my house, 34-ft. from the ground and 56½-ft. above the level of the sea, from which it is barely 50 yards distant. I have thus a position open on all sides, my horizon varying in distance from half-a-mile to seventy miles, and averaging twenty-five. Upon this platform I have erected a louvre-boarded shed for my thermometers, and have set up my rain-gauge, &c. The latter has its mouth 61 ft. 3 in. above the sea level, and the thermometers are only a few inches above or below this. I thus gain an excellent position for my maximum thermometers and for my hygrometer, with thorough circulation of air and security for all the instruments. The principal disadvantage is, that my minima run too high. 36° in my shed means ice in the streets, and any thing below 40° generally finds hoar frost in the vineyards. I also keep up there a minimum thermometer exposed to the sky, but it averages only from 2° to 3° below that in the shed.

By the help of Mr. Kuchler I have continued the observations with the old instruments in the old place ('Symons's Meteorological Magazine' for July 1871), and find, on comparing results, that the rainfall recorded is very nearly the same at each place; that the highest maxima there recorded have been too low by 2° or 3°, and the lowest too high, while the averages were about right; and that the minima were about 2° or 3° lower than those in my new shed.

I am now provided with a standard barometer, maximum and minimum, and sundry ordinary thermometers whose errors I know, a sun thermometer, a wet and dry bulb thermometer, and one of Messrs. Negretti and Zambra's so-called chameleon barometers, which I find to be an accurate and excellent *hygrometer*.

In July I put a rain-gauge in charge of Mr. James Saunders at Argostoli in Cephallonia, a town situated on the edge of a narrow gulf which runs in from the south and doubles back into the very heart of the island. He has the gauge on the roof of the house, 35 ft. from the ground, and 37 feet from the sea, from which it is separated only by the road.

Rainfall.—This has been, I should imagine, about the average. The number of wet days, however, has been great, and the distribution of them among the months more equal than usual. The deficiency in the autumn rainfall of 1872 was partly made up by a wet February, and by the long continuance of showery weather in the spring. April was wet for this place, and May

most unusually so. Nevertheless, many wells were dry during the summer and autumn that were not expected to fail. The summer broke up with heavy thunderstorms on September 24th and 25th, when 3·94 inches fell in 40 hours. October 15th-22nd gave very heavy rains over Western Greece, of which, somehow, Patras got very little. Dense black clouds were discharging themselves among the mountains on the opposite coast, not ten miles off, and on the afternoon of October 20th we narrowly escaped the most fearful storm cloud I ever saw. It marched up the Gulf of Patras from the west, passed within a mile or so of this town, and proceeded through the Straits into the Gulf of Corinth. The sea and cloud were mingled in one confused whirling mass of inky blackness, and the mere side wind which reached us was enough to carry tables and chairs about the streets. The rain-gauge in Argostoli overflowed on that same day, and all its streets were flooded. December was very dry in Patras, north-east winds prevailing all through the month; while in Cephallonia, where I presume the north-east and south-west winds met, the rainfall, as will appear by the tables, was very heavy.

Temperature.—The year has been remarkable for sudden fluctuations and great ranges of temperature. What winter there was came in February, when a course of rains terminated in a very heavy fall of snow on the mountains, which produced considerable cold when the weather cleared. March and May, and July and September, in particular showed fluctuations extraordinary in this climate. In July, a maximum of 101°·5 and minimum of 78°·5 on the 17th, were followed by a maximum of 78°·5 and minimum of 64°·5 on the 21st. August was on the whole the hottest month I have yet experienced here, the maximum temperatures remaining steadily above 90° the greater part of the month. Indeed, from July 27th to August 9th, inclusive, the maximum averaged 96°·7. September, however, was the most remarkable for extremes and changes. A maximum of 101° (caused by a hot land wind late in the afternoon of the 8th) and of 64°·7 (on the 25th, after the excessive rain of the previous day) are not often found in the same month.

Humidity.—The air of Patras must be more remarkable for dryness than I had thought. I saw with surprise in the February number of 'Symons's Meteorological Magazine,' that M. Bulard, in Algiers, had to go back to 1869 in order to find a difference between the wet and dry bulbs equal to that which occurred here many times last summer. This year is the first in which I have had a really good place for my hygrometer, so that I cannot compare my results with those of former years.

Barometer.—The observations from January to May were made with only an aneroid, but from June to December with a standard mercurial barometer. The very small range, but just exceeding the inch in the whole year, is the most noticeable thing.

Wind.—Situated as Patras is, near the narrow entrance to the Gulf of Corinth, shut in on either side by high mountains, the true direction of the wind is very much distorted. It is a question between in-draught and out-

draught. We only ask whether the wind is from the Gulf (which may be a hot SE or cold NE), or from the sea (which may be either a damp SW, or a mild W, or a refreshing NW). The accompanying Tables will, however,

TABLE I.—Rainfall in Patras in 1873.

Day of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
1	..	·21	·19	..	·01	..	..	..	..	..	..	..
2	..	..	·67	·01	..	..	..	..	..	..	..	·07
3	..	·53	·49	·44	·12	..	..	..	..	..	..	·24
4	..	..	·08	..	·02	..	..	..	..	..	..	..
5	..	..	·01	..	..	..	..	..	..	..	·84	..
6	..	·59	..	..	·39	·01	..	..	..	..	·02	·22
7	..	·20	..	·09	..	..	..	..	..	..	..	·12
8	..	..	..	·01	..	·01	..	..	..	..	..	..
9	..	·07	..	..	·91	·02	..	..	..	..	..	..
10	..	·58	..	..	·16	..	..	..	..	..	·31	..
11	..	·57	..	..	·11	..	..	..	..	..	·03	..
12	..	·98	·01	..	·03	·20	..	..	..	..	..	..
13	..	·64	..	·51	·12	..	..	..	..	..	..	..
14	..	·22	·05	·02	..	..	..	..	..	..	·38	..
15	..	..	..	..	..	..	..	..	..	·01	·87	..
16	..	..	..	..	..	..	..	..	..	..	·39	..
17	..	..	..	..	..	..	..	..	..	..	..	·03
18	..	..	..	..	..	..	..	..	..	·27	..	·05
19	·47	..	·04	·01	..	..	..	..	..	·24	..	..
20	·03	..	..	..	..	..	..	..	..	·14	·01	..
21	·52	..	..	·01	..	..	..	..	..	·29	..	..
22	·08	..	..	..	..	..	..	..	..	·08	..	..
23	·76	·14	·05	..	..	·01	..	..	·93	..	·37	·01
24	·01	..	..	·05	·01	..	..	..	2·36	..	·01	..
25	·01	..	..	..	·16	..	..	..	·65	..	..	..
26	·73	..	..	·02	·25	..	..	..	·08	·16	..	..
27	·02	..	·12	·34	..	..	..	..	..	..	..	..
28	..	..	·01	..	..	..	..	..	·02	..	·48	·04
29	..	..	..	·31	·52	..	..	..	·01	..	·67	·73
30	·01	..	..	·02	..	..	..	..	·15	·08	..	·03
31	..	..	..	..	..	..	..	·48	..	..	..	·29
Totals ..	2·64	4·73	1·72	1·84	2·81	0·25	0·00	0·48	4·20	1·27	4·38	1·83

Total during year=26·15.

Number of days on which not less than ·01 fell.

Totals ..	10	11	11	13	13	5	0	1	7	8	12	11

Total during year=102.

Number of days on which drops of rain, however few, fell.

Totals ..	11	12	12	15	15	7	2	1	8	9	15	14

Total during year=121.

TABLE II.—Rainfall in Argostoli in Cephallonia. By J. Saunders, Esq.

Day of the Month.	August.	September.	October.	November.	December.	Day of the Month.	August.	September.	October.	November.	December.
	In.	In.	In.	In.	In.		In.	In.	In.	In.	In.
1	..	..	..	..	·32	18	..	·01	1·06	·01	..
2	..	..	..	..	2·35	19	..	..	·55	·02	..
3	..	..	..	.	1·7	20	..	..	*2·11	·01	..
4	..	..	..	..	..	21	..	..	·14	·06	..
5	..	..	..	1·25	..	22	..	..	·32	·15	..
6	..	..	..	·04	·93	23	..	·29	..	1·00	2·34
7	..	..	..	..	·11	24	..	2·13	..	·05	·09
8	..	..	..	..	·02	25	..	·14	..	..	·04
9	..	..	..	..	..	26	..	·98	·14	..	..
10	..	..	..	·96	·04	27	..	·11	·26	·02	..
11	..	..	..	..	..	28	..	·64	..	·50	·01
12	..	..	..	..	..	29	..	·40	..	1·14	·32
13	..	..	..	..	..	30	..	·13	..	·29	·09
14	..	..	..	·59	..	31	..	..	..	..	·23
15	..	..	·15	·38	..						
16	..	..	·39	·51	·09						
17	..	·03	..	·01	·16	Totals ..	..	4·86	5·12	6·99	7·31

Total=24·28.

Number of days on which not less than ·01 fell.

	August.	September.	October.	November.	December.
Totals	0	10	9	18	16

Total=53.

throw some light on the heat and cold, the wetness and dryness of the different months. The gales worth special notice were:—

One on March 23rd-27th, from the E, which, beginning with the greatest maximum and minimum of the month, finished with the lowest, and snow on the mountains.

A very tremendous squall on September 17th from NW, *i.e.* dead on shore, from the mountains on the opposite coast, where there was a thunderstorm. It lasted but a few minutes, but was dragging all the vessels from their anchorage; and had it lasted longer, would have had them all on shore. I was myself on that opposite coast at the time, nine miles distant, and when the storm was passed I saw a large yellow cloud (of dust) hanging over Patras, its base being about 400 ft. above the sea, its upper surface twice as many.

* A very sudden and heavy rainstorm caused the receiver to overflow in the absence of Mr. Saunders.

TABLE III.—Temperature at Patras in 1873.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
Average Max. Temp.	59·2	59·4	65·7	69·5	75·2	80·8	90·7	92·3	81·8	75·7	66·3	58·8
Greatest Max. Temp	65·0	70·0	82·0	79·0	92·0	91·7	101·5	99·7	101·0	82·0	79·0	65·8
Least Max. Temp. ..	53·0	48·5	60·2	63·0	65·0	73·3	78·8	80·6	64·7	68·0	56·0	50·2
No. of Max. between 104° and 100°	..	..	..	..	..	..	2	..	1	..	..	..
99 „ 95	..	..	..	..	..	..	6	11	1	..	..	..
94 „ 90	..	..	..	..	1	2	11	14	3	..	..	..
89 „ 85	..	..	..	..	2	3	8	4	4	..	..	..
84 „ 80	..	..	1	..	5	13	2	2	12	7	..	..
79 „ 75	..	..	..	4	5	8	2	..	4	10	3	..
74 „ 70	..	1	2	9	9	4	..	..	3	13	6	..
69 „ 65	1	2	13	12	9	..	..	..	1	1	9	3
64 „ 60	13	12	15	5	..	..	..	..	1	..	6	8
59 „ 55	12	8	..	..	..	..	..	..	..	..	6	16
54 „ 50	5	3	..	..	..	..	..	..	..	..	..	4
49 „ 45	..	2	..	..	..	..	..	..	..	..	..	..
	°	°	°	°	°	°	°	°	°	°	°	°
Average Min. Temp.	40·7	46·1	50·6	53·6	57·3	63·5	70·7	72·4	66·8	62·4	55·6	48·3
Greatest Min. Temp.	54·0	55·2	60·0	62·6	72·5	70·3	78·5	79·0	73·5	69·0	71·0	56·0
Least Min. Temp. ..	41·0	34·0	44·8	46·4	49·1	56·4	65·3	68·5	57·8	58·5	43·5	37·5
No. of Min. between 79° and 75°	..	..	...	..	..	..	2	4	..	..	..	..
74 „ 70	..	..	..	..	1	1	15	24	9	..	1	..
69 „ 65	..	..	..	..	1	8	14	3	12	3	..	..
64 „ 60	..	..	1	4	8	16	..	..	7	24	5	..
59 „ 55	..	1	..	8	8	5	..	..	2	4	14	3
54 „ 50	7	5	20	13	11	..	..	..	..	..	3	10
49 „ 45	15	11	9	5	2	..	..	..	..	..	6	11
44 „ 40	9	9	1	..	..	..	..	..	..	..	1	5
39 „ 35	..	1	..	..	..	..	..	..	..	..	..	2
34 „ 33	..	1	..	..	..	..	..	..	..	..	..	..

And a terrible gale on December 7th, 8th, and 9th, from the E, which, during its greatest violence during the night of the 8th, blew down a tall gas chimney, numbers of trees, carried away tiles innumerable, and drove a three-masted English schooner anchored at the entrance of the Gulf of Patras clean over some rocks, and left her a total wreck in but a few inches of water.

Earthquakes have been tolerably frequent, and some of them considerable: one in particular on October 25th, just before midnight, after the spell of heavy rains before alluded to, was of unusual duration, and caused us much alarm, bringing down plaster, and even cracking walls. This earthquake had its centre near Cape Clarentza, opposite to Zante, where it caused great destruction. Scarcely a house in Zante but what needed repair, and the villages near the said Cape were some of them quite overthrown. A ship even sailing between Zante and Clarentza, when in mid-channel and deep water was shaken violently, as though it had run on to a rock.

	Jan	Feb.	Mar	Apr.	May	Jun	July	Aug	Sep	Oct	Nov	Dec
	°	°	°	°	°	°	°	°	°	°	°	°
Average Max. Temp. in Sun..	109·7	116·9	127·0	129·7	137·0	141·2	147·8	148·1	139·2	135·0	122·4	110·2
Greatest " " ..	124·0	128·5	141·0	141·5	151·0	156·0	161·0	154·0	154·5	153·5	137·0	128·0
Least " " ..	82·5	56·0	82·0	81·0	108·5	124·0	136·5	133·0	97·0	114·0	66·5	62·0
No. of Maxima between												
165° and 160°	..	..	..	..	..	..	1	..	..	..	..	..
159 " 150	..	..	..	..	1	3	11	14	2	1	..	..
149 " 140	..	..	2	2	12	15	17	16	18	7	..	..
139 " 130	..	..	14	19	13	11	2	1	7	19	8	..
129 " 120	4	11	12	6	4	1	..	..	1	3	14	5
119 " 110	7	8	..	..	..	..	..	..	..	1	5	18
109 " 100	1	2	1	2	1	..	..	..	..	..	..	3
99 " 90	1	2	1	..	..	..	..	..	2	..	1	2
89 " 80	3	2	1	1	..	..	..	..	..	..	1	..
79 " 70	..	1	..	..	..	..	..	..	..	..	..	1
69 " 60	..	1	..	..	..	..	..	..	..	..	1	2
59 " 55	..	1	..	..	..	..	..	..	..	..	..	..

* Omitting January 1-15. These 15 days were, however, with one exception, sunny and warm, so that the average of the 31 days would probably have been not less than 114°.

TABLE V.—Humidity at Patras in 1873. Calculated from Glaisher's Tables.

Hour.	8.30 a.m.	9 a.m.	9 a.m.	8 a.m.	8 a.m.	8 a.m.	8 a.m.	8 a.m.	8 a.m.	8 a.m.	8 a.m.	8 30 a.m.
Month.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
Maximum Humidity	89	95	86	83	96	79	73	71	94	88	90	84
Minimum Humidity	55	50	38	34	36	53	35	28	36	55	49	44
Average Humidity	70·7	74·6	64·0	65·1	68·2	66·1	57·4	50·3	60·4	72·0	71·7	64·3

The greatest observed dryness at any hour in the course of the whole year was on August 9, at noon, when the dry bulb showed 97° and the wet bulb 66°. Differences exceeding 25° in the readings of the dry and wet bulb were common during the summer. On August 22, at 10 p.m., the dry bulb showed 85° and the wet bulb 61°.

[feel tempted to digress to the extraordinary cold we have had during the
it weeks, and are still having. February 1874 will be long remembered
his country. For frost, snow and wind we have not for years had its like.
one occasion, a bright sunny day, the wick of my hygrometer, freshly
aned at noon, was frozen hard at 1 p.m.

TABLE VI.—Barometric Pressure at Patras in 1873. Reduced to sea level at 32° Fahrenheit.

Month.	Jan.*	Feb.*	March.*	April.*	May.*	June.	July.	August.	Sept.	October.	Nov.	Dec.
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Greatest observed pressure	30·63	30·67	30·32	30·28	30·028	30·458	30·067	30·151	30·146	30·219	30·324	30·361
Least observed pressure	29·84	29·73	29·62	29·68	29·78	29·734	29·783	29·884	29·640	29·827	29·660	29·769
Average pressure at the hour of observation, viz.	30·29 8.30 a.m.	30·18 9 a.m.	30·02 9 a.m.	30·04 8 a.m.	30·02 8 a.m.	30·005 8 a.m.	29·941 8 a.m.	29·974 8 a.m.	29·993 8 a.m.	30·080 8 a.m.	30·006 8 a.m.	30·135 8·30 a.m.

* The Tables for January-May give the readings of an Aneroid which was not "set" at all during the whole year, and whose error in June averaged 0·78 inches in excess, and in December averaged ·172 in excess.

TABLE VII.—Showing the direction of the Wind at Patras in 1873.

Month.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Number of days on which the direction of the wind was at all easterly........	10	13	10	11	4	4	10	19	11	14	15	16	137
Number of days on which the direction of the wind was at all westerly	19	13	17	16	24	21	14	8	15	11	8	10	176
Number of days which, owing either to calm or changing, must be reckoned separately	2	2	4	3	3	5	7	4	4	6	7	5	52

TABLE VIII.—Amount of Cloud at Patras in 1873.

Month.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Average.
Daily Average of Cloud on scale 0—10	4·4	5·2	4·5	4·5	4·7	3·6	1·9	1·4	2·6	3·5	5·0	4·5	3·82
Number of days on which there appeared—													Totals.
Clouds obscuring the sky entirely, or nearly so, all day	6	12	6	6	9	4	0	0	6	6	11	10	76
Clouds of various densities and extent scattered over the sky	19	10	17	17	16	16	9	4	3	12	14	10	147
No clouds at all, or but a few small ones on the mountains or on the horizon..	6	6	8	7	6	10	22	27	21	13	5	11	142

DISCUSSION

Mr. SCOTT said that he understood from Mr. Boys that he intended to leave Patras in the course of the present year, which was a great pity, inasmuch as he was a very good observer, although, perhaps, his views on some subjects were rather peculiar. Inasmuch, however, as the present paper referred only to the year 1873, he would suggest that Mr. Boys should be asked to send, as soon as possible, the report for 1874, for comparison with previous years.

Mr. SYMONS said that he had recently received a letter from Mr. Boys stating that, although he would leave Patras shortly, he hoped that the observations would be continued, as he had instructed an observer how to take them. The observations for 1874 would be ready shortly, and would be communicated to the Society.

The PRESIDENT, in calling attention to the high readings of the thermometer in the sun's rays in mid-winter, said he thought this was in a large measure due to the extreme dryness of the air at the time.

Mr. LAUGHTON believed that the great dryness spoken of was a characteristic of the Greek climate generally. He had himself, in 1863, noticed it at Athens, where, during the summer, a difference of more than 20° between the wet and dry bulb thermometers was quite common, and the sky was one uniform, monotonous tint of greyish blue, seen through a dust haze. This continued for months, and the first rain fell in the end of October.

The PRESIDENT said he believed the insular and peninsular lands of the the western track of the Mediterranean were, as a general rule, dry.

Dr. TRIPE said that the Tables appeared to have been prepared with very great care. In looking through the rainfall table he found that there were only 5 days in June, none in July, and 1 in August on which rain fell, which accounted for the drying effect of the air mentioned by the last speaker. From June 24th to Augnst 30th, inclusive, a period of 68 days, no rain fell whatever; it was also dry from September 1st to 22nd.

XXXIV. *Ozone.* By FRANCIS E. TWEMLOW, F.M.S. (Abstract.)

[Received January 20th. Read March 17th, 1875.]

FEW substances have created more interest in the scientific world during the last few years than Ozone. Its nature, composition, and properties, and the means of detecting its presence, have all been subjects of much discussion.

Several discoveries have been made respecting it which, although they enlighten us about some of its properties, still leave a great deal in obscurity.

The first recorded notice of it is by Van Marum, in 1785. This philosopher was noted for his observations in the Science of Electricity, and it was in connection with electrical action that the first observation on Ozone was made. Every one who has stood near a powerful electrical machine working rapidly on a dry day, must have noticed the peculiar odour which exists near the machine. Van Marum observed this, but without any suspicion of its true nature, and attributed it to the "electric matter," which he thought had a tangible existence.

The subject then rested until about 1840, when it attracted the attention of M. Schönbein, of Basle, who appeared to have entertained very opposite theories respecting its nature. He called it "Ozone," on account of its peculiar odour. At first he thought it to be an element analogous in its nature to the Halogen group—Chlorine, Bromine, Iodine, and Fluorine.

This mistake may well be excused, as it bears a very strong likeness indeed to Chlorine. Like that element, it possesses remarkable bleaching properties, rapidly removes bad smells, such as Sulphuretted Hydrogen, &c.; it is very irritating to the air-passages, and even poisonous in its action when breathed, and when in a concentrated condition it smells much like Chlorine.

Schönbein's views, however, soon underwent alteration, and in a subsequently published paper he appears to have considered the possibility of its being a constituent of Nitrogen.

Other chemists were meanwhile at work upon ozone. Williamson in this country advanced the idea that it was a compound of Oxygen and Hydrogen, resembling that now well-known compound Hydroxyl.

Elsewhere the true state of things was gradually being worked out: MM. Marignac and De La Rive in Paris, and Schönbein quite independently at Basle, had come to the conclusion that ozone after all was nothing but an allotropic condition of oxygen, and that it was simply that element existing in molecules each composed of *three* atoms instead of *two*, which is its usual condition.

This was shortly afterwards experimentally demonstrated by MM. Frémy and Becquerel. The difficulties of the experiment were great, until the plan of absorbing the ozone as it was formed, by means of oil of turpentine, was tried. The whole of a given quantity of oxygen could now be converted into ozone by dissolving, as it were, each atom of ozone in oil of turpentine, as fast as it was formed. Previously by no known method could more than a small portion of the oxygen be converted into ozone, the presence of this small quantity seeming to prevent the formation of more.

It is now believed that this strange substance plays a more important part in the economy of nature than at first seemed probable. Daubeney has demonstrated that all plants growing in the sun give out small quantities of a body which decomposes Iodide of Potassium, liberating the Iodine, as is shown by its action upon starch. Chlorine and Nitrous Anhydride act in a similar manner, it is true, but the absence of these two bodies was proved.

It seems not unlikely, then, that ozone is an active agent in the bleaching of linen, which takes place when it is laid on grass and exposed freely to the rays of the sun.

In thunderstorms, and especially after large discharges of electricity have taken place between the earth and the clouds, numerous observers have borne testimony to the fact that a peculiar smell has been perceived, which some have compared to the odour of matches and phosphorus. Schönbein records a remarkable instance of this fact, showing that the smell which is perceived after flashes of lightning is really that of ozone.

It has been supposed that there is some connection between the outbreaks of zymotic diseases, and the absence of ozone in the air. On the germ theory of diseases, all persons or animals suffering from contagious diseases may be regarded as sources of infection, by giving off organic fragments which are capable, should they meet with a suitable home, of propagating the disease. Now if ozone is present, these germs will be destroyed by it,

and their substance converted into comparatively innocuous bodies, Carbonic Anhydride, Ammonia, &c.

In 1849, the noted cholera year, the absence of ozone was remarkable, as the following table by M. Quetelet will clearly indicate:—

Average amount of Ozone in the Atmosphere.

	1844 to 1848.	1849.
January	53	39
February	47	36
March	38	27
April	27	20
May	21	16
June	18	13
July	19	14
August	21	21

Whether the absence of ozone is the cause of these infectious diseases assuming an epidemic form or *vice versâ*, is not clearly understood.

Observations made in India have indicated a relation between the diminution in the amount of ozone in the air and the increase of cholera, dysentery, and intermittent fevers in certain localities.

In 1849, the cholera raged with special virulence in Paris, and some remarkable facts with respect to the absence of electricity in the air were noted at that time by M. Andrand, who had constructed a very large and powerful electrical machine from which sparks could usually be obtained in abundance. In a letter to the President of the Academy of Sciences of France he says, "During the time the epidemic became general I was un- " able on any single occasion to produce corresponding effect. During the " months of April and May, sparks could only be procured after the most " violent action. These fluctuations were then observed to coincide most " exactly with the fluctuations of the cholera. Nevertheless, I was afraid " lest the irregularities of the electrical machine should have been occasioned " by the hygrometric state of the atmosphere. I waited with impatience the " arrival of fine weather, to enable me to continue my observations: but " far from the previous indications of the machine showing any signs of " diminution, they only became stronger; for although with improved weather " an augmentation of electricity might have been expected in a few days, the " signs of its presence ceased altogether. On the 4th, 5th, and 6th of June, " it was only possible to obtain a slight crepitation, and on the 7th the " machine became *dumb*. This singular decrease in the electric element " fatally accorded with a consentaneous increase of the cholera. On the 8th, " feeble sparks re-appeared, and increased in number and intensity. In the " course of the day a thunderstorm announced to plague-stricken Paris that " electricity had once more entered into its dominion. On the 9th, at the " slightest touch the machine gave forth sparks in abundance. Meantime " the cholera was rapidly subsiding."

Very commonly an epidemic of cholera is succeeded by a prevalence of severe attacks of influenza. Dr. Moffatt remarks that "the prevalence of

influenza, and the spread of catarrhal affections, are invariably connected with an excess of ozone in the atmosphere."

So far as research has gone, the ordinary amount of ozone in the air appears to be about one ten-thousandth of its bulk. Small as this may seem, there is yet reason to believe that its functions are of considerable importance.

The general characteristics of ozone are those of an oxidising agent. Thus it corrodes organic matter, as shown by its rapid action on caoutchouc or vulcanite connectors. It bleaches most vegetable colours, as exemplified particularly by its conversion of indigo into isatin. It oxidises black sulphide of lead into white sulphate of lead, changes the yellow ferrocyanide of potassium into red ferridcyanide of potassium, and colours moist sulphate of manganese brown from formation of the hydrated peroxide. It is absorbed by moist iron, copper, mercury and silver, and produces their respective oxides.

Moist silver is even converted into the state of peroxide. Dry ozone is also readily absorbed by dry mercury and dry iodine. In some cases, however, ozone acts as a deoxygenant. Thus it decomposes peroxide of hydrogen and peroxide of barium, with evolution of inactive oxygen, derived both from the ozone and the peroxide. Ozone is practically insoluble in water and acid solutions. If ozone be heated, it loses all these properties, and the resulting gas is oxygen.

A remarkable feature connected with the oxidising of ozone is stated by Prof. E. Reynolds, that if a photographic plate on which an image has been taken, but which has not yet been developed, be exposed to the action of ozone, the latent image is destroyed, and another photograph may at once be taken on the same plate. This may possibly be the reason, why on some days a long time has to be expended before an image can be formed. On such days, ozone may be present in large quantities, dissolving the image as soon as formed.

Numerous tests for ozone have been devised, almost all based upon its oxidising properties; but as yet none have proved thoroughly satisfactory and reliable.

Starch paper, impregnated with a solution of iodide of potassium of known strength, is generally used for determining the relative quantity of ozone in the air. The slips of paper so prepared are exposed for a given time to the air in a wire gauze cage, so constructed, that while it admits the free passage of air, it prevents the action of light.

If any ozone be present, it oxidises the potassium of the potassium iodide; the iodine thus set free reacts upon the starch, forming a blue iodide of starch, and by the amount and depth of colour so produced the amount of ozone in the air is ascertained by comparison with a scale coloured in different shades of blue from 1 to 10. But the indications thus afforded are uncertain, the rapidity of the action being modified by various circumstances, as by the temperature and humidity of the air; moreover, the paper once coloured by ozone becomes decolorised again by continued exposure, and the same effects of coloration and subsequent decoloration may be produced by other gases in the air, chlorine and the oxides of nitrogen, for example.

For these reasons, Houzeau prefers litmus paper, slightly reddened and impregnated with iodide of potassium. This paper turns blue in the presence of ozone, the coloration arising from the liberation of a certain quantity of potash and separation of iodine. The same change of colour is not produced by any other gas except ammonia, and the blueing produced by this reagent is easily distinguished from that arising from the action of ozone, inasmuch as it is likewise produced on red litmus paper not containing iodide of potassium. Chlorine, bromine, iodine, nitrous compounds and acetic acid, change the red colour of the prepared paper to reddish yellow. Paper soaked in a solution of thallious oxide is recommended by Böttger as the best reagent for the detection of ozone, because it is turned brown by ozone, but not affected by nitrous acid. But according to Huizinga, it is even bleached by nitrous acid if previously coloured brown by ozone; accordingly, the browning of thallium paper exposed to the air will, in most cases, be only the difference between the two opposite actions of ozone and nitrous acid, and sometimes will not take place at all, in consequence of the action of the latter equalling or exceeding that of the ozone.

The chief points of difference between ozone and ordinary oxygen are:—

1. It liberates iodine from iodide of potassium.
2. It oxidises rapidly the precious metals.
3. It destroys vegetable colours.
4. It possesses a remarkable smell, whilst oxygen is odourless.

It was proved in 1852 to be composed of oxygen only, and the next step was evidently to examine into the structure of its molecule. A great number of experiments gave its atomic weight as 24, and consequently its molecular weight as 48; which is just the weight of three atoms of oxygen, of which accordingly it is believed to be composed.

It is found that when any body is oxidised by air containing ozone, no contraction of the air takes place after oxidation has been effected, although obviously the air must have parted with some constituent to oxidise the body in question. This, however, may be accounted for by supposing that in each molecule of ozone one atom of oxygen is held in a loose state of combination, and that after its release, the molecule of oxygen left occupies the same space as the molecule of ozone did before; the two atoms occupying the place of three.

DISCUSSION.

Dr. Tripe observed that the paper was received as affording a means of bringing forward the chemistry of ozone, and of eliciting the opinions of the Meeting as to its relation to meteorology. He said that although there is no doubt as to the generation of ozone during a thunderstorm, there is no evidence to connect all the ozone in the air with electricity, or even to prove that the discoloration of the test papers is due to ozone alone. On the contrary, the greatest change he ever observed in the papers was caused by the nitrous acid, and, perhaps, other gases set free during the exhibition of a very large quantity of fireworks, about a mile from his station. As regards the ozone in air coming from the sea, it has been suggested that it is given off by animalcules living in the sea, and on the land by vegetation, and especially by sweet-smelling flowers. Whatever may be its origin, it is certain that the products of the combustion of

fuel in large cities destroy the ozone as it comes from the sea or country; for it has been proved that air which contained ozone on arriving at Fulham, did not contain any ozone at Hackney, and *vice versâ*. In other words, on those days when the wind blew from Fulham to Hackney, ozone was detected at Fulham and not at Hackney, and the contrary. He always felt great exhilaration when breathing mountain air, which contained a large proportion of ozone; and there is little doubt that the feeling of *malaise* so much complained of by those who pass a large portion of their lives in close rooms, is caused by the want of ozone in the air of the room, and consequent imperfect oxidation of effete matters in the body.

The PRESIDENT pointed out that ozone was developed in the flash of lightning, and was in all probability produced by the action of the electrical discharge exerted upon the oxygen lying in its path.

Mr. STRACHAN said, if any one had asked him where to get information about ozone, he should have referred to Prof. Andrews's lecture; and if that was not enough, to Dr Fox's book. He thought that the paper they had just heard had almost entirely missed the meteorological bearings of ozone, and this was precisely the information which he for one would be glad to get. Not having experimented with any kind of ozone papers himself, he knew very little about the subject, except chemically. He knew, however, that great pains had been taken in observing the test papers by many meteorologists, and feared that they could make out very little for certain about this mysterious agent.

Mr. SCOTT remarked that the author of the paper seemed to him to have studiously avoided mention of the meteorological aspect of the question of ozone, as he had gone at some length into the theory of the substance, and its preparation. In fact, the paper ought to have been brought before a chemical audience; but it seemed strange to him that an English paper on ozone contained no mention of the name of Professor Andrews. Inasmuch, however, as ozone was known to be allotropic oxygen, and to exert a considerable influence on animal and vegetable organisms, owing to its chemical activity, he (Mr. Scott) thought it would not be amiss if he gave the Society a brief account of a paper which had recently appeared in the Austrian Journal for Meteorology, on a subject allied to ozone, viz. on the proportion of oxygen in the air in different localities.

The author is a Dr. UCKE, a physician at Samara, and he begins by saying that nature does not wait for science to discover its facts, but makes them out for herself, and then lets science show the reasons afterwards.

This is most strikingly the case as regards the salubrity of the air in different localities, which is known long before the conditions of their climate have been determined by instrumental observations. The fame of health-resorts is traditional, handed on from patient to patient, but we have no scientific explanation of the freedom from certain diseases which certain places enjoy.

Samara is on the Tigris, in 34° N lat., not far from Bagdad, with an intensely continental climate, and on the open steppe, with no shelter from any winds, so that it would seem to be the last place in the world for invalids; yet it is frequented by them, and with much benefit.

The author thinks this must be due to the composition of the air, and he deals with the question of the oxygen in the present paper; leaving the ozone for a later communication.

The unit taken is the amount of oxygen passing through the lungs in a month, taking 500 centimetres at each inspiration, and 13·5 breaths a minute.

The amount of oxygen in a volume V of damp air is:—

$$V \times \frac{p-f}{760} \times \frac{1 \cdot 10563 \times 0 \cdot 21}{773 \cdot 5\,(1+a\,t)}$$

in which p and f are the barometrical pressure and vapour tension; $\frac{1 \cdot 10563}{773 \cdot 5}$ the sp. g. of oxygen referred to water; 0·21 the per centage of oxygen in normal air, and a the co-efficient of expansion of air.

He complains of the great difficulty which he finds in obtaining materials: no trustworthy observations exist for such places as Nice or Madeira. Finally, he takes 17 places, which will be seen in the subjoined table, together with the amount of oxygen in kilograms inhaled in each of the stations.

Kilograms per Month.

Sitka	89·01	Vienna	86·18
Barnaul	90·68	Stuttgart	86·06
Jekaterinenburg	88·80	Brussels	87·24
Samara	91·60	London	87·48
St. Petersburg	90·39	Peissenberg	79·24
Lugan	88·02	Nasirabad	78·63
Warsaw	87·72	Madras	80·74
Berlin	88·02	Seringapatam	75·88
Prague	86·11		

The following is the mean distribution through the different months :—

June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.
82·7	82·2	82·6	84·1	85·8	87·8	89·3	90·2	89·3	88·1	85·8	84·0

If we now analyse these stations, we find they form certain groups. We find that the Indian stations come by themselves, with a defect of oxygen; then Peissenberg in Bavaria, the station at the highest level of all; then Sitka, and then the 12 northern European-Asiatic stations; which on the whole show a decrease in a direction from E to W.

The total annual amounts in kilograms in the following groups are :—

I.—1st division.	Samara, St. Petersburg, Barnaul, Jekaterinenburg	1084·6
II.—Sitka		1068·1
I.—2nd division.	Lugan, Warsaw, Berlin	1055·0
I.—3rd „	Brussels, London	1048·3
I.—4th „	Prague, Vienna, Stuttgart	1033·4
III.—Peissenberg		950·8
IV.—Nasirabad, Madras, Seringapatam		940·9

The difference between the extremes is 140 kilograms, and, as will be seen, the amount of oxygen passing through the lungs in a year is not far from a ton.

If we now take the 1st group alone, we may take the following as the mean meteorological constants for each division.

Stations.	Temp. Fahr.	Elastic Force of Vapour.	Barometer.	Oxygen.
	°	In.	In.	
Samara, Barnaul, St. Petersburg, Jekaterinenburg	37	·208	29·745	1084·5
Lugan, Warsaw, Berlin	47	·244	·662	1055·0
London, Brussels	51	·327	·780	1048·3
Prague, Vienna, Stuttgart	50	·256	·268	1033·0

This shows us, in conjunction with the formula given above, how the amount of oxygen is reduced by rarefaction, heat, and humidity.

The central European stations are the worst, if we except those in India and Peissenberg.

Lastly, if we examine into the excess or defect of oxygen in the different seasons above the mean at the last twelve stations, we get the following figures :

Stations.	Summer.	Autumn.	Winter.	Spring.
Barnaul	−0·4	+3·1	+5·7	+2·6
Jekaterinenburg	−1·2	+1·1	+2·2	+0·4
Samara	+1·3	+3·7	+6·0	+4·0
St. Petersburg	+2·1	+2·6	+2·2	+3·0
Lugan	−1·5	−0·1	+1·0	−0·2
Warsaw	0·0	−0·6	−1·1	−0·4
Berlin	+1·2	−0·5	−1·2	−0·1
Prague	−1·4	−2·3	−2·8	−2·8
Vienna	−1·9	−2·2	−2·7	−2·6
Stuttgart	−0·9	−2·5	−3·9	−2·6
Brussels	+0·9	−1·3	−2·9	−0·7
London	+1·4	−1·0	−3·0	−0·5

From this we see that London and Brussels have positive figures in summer, as does also Berlin, but all other European stations exhibit negative values except St. Petersburg, which is positive throughout the year. Samara heads the list of positive deviations, and hence, according to Dr. Ucke, the specialty of its climate.

Dr. Tripe said that the results arrived at by the author of this paper were opposed to the conclusions lately arrived at by other observers, as consumptive cases are now frequently sent to mountain-tops, where there was less oxygen in a given bulk of air than at lower elevations, so as to prevent waste as far as is possible.

Mr. Whipple asked Mr. Scott whether the author had made any mention of the amount of vegetation in the vicinity of the station, as this might cause a difference in the amount of oxygen in the air.

Mr. Strachan asked whether a similar formula would not bring out similar results for nitrogen.

The President said that in considering questions of this class it should never be overlooked that Nature effects a very large measure of compensation for augmentation or diminution, retarding or quickening, the breathing.

Mr. Scott, in reply to Mr. Whipple, said that the author had not alluded to the state of vegetation about Samara. As to Dr. Tripe's remarks, he would only say that Dr. Ucke asserted that pulmonary complaints were almost unknown at the place. Mr. Strachan was perfectly right in suggesting that the formula would give the amount of nitrogen just as well as of oxygen, but as nitrogen was a perfectly inactive body, it was the amount of oxygen which was of importance.

XXXV. *On the Annual Means of Thirteen Years' Observations at London*. By R. Strachan, F.M.S.

[Received January 26th. Read March 17th, 1875.]

Having brought before the Society the results of my observations for each month of the thirteen years 1861-73, it appears to me desirable for the sake of completeness, if for no other purpose, also to invite the attention of the Society to the annual results for this period. Accordingly, I have entered in the accompanying Table the annual values of the meteorological data for each of these years, derived from the monthly values by summing and meaning, giving also the averages of the entire series as normal means with which the annual means may be compared; following, indeed, the same method that was adopted in discussing the monthly means.

Assuming that the winds all blew with equal strength, I have calculated the annual resultant for direction and duration for the thirteen years, and have found it to be N 88° W, 86 days. Similarly for the four years, 1861-4, the resultant is N 87° W, 87 days per annum. It will be seen by the Table that the average annual resultant for the direction and force of wind, is S 84° W, 0·95. For the years 1861-4, the yearly resultant is S 84° W, 1 nearly. These results for the first four years were published in the *Horological Journal* in 1865. It has been a surprise to me that the results for the thirteen years agree so completely with those for the first four.

The mean annual value for pressure, from observations made at 9 a.m., is 29·958 inches; the mean temperature of the air for that hour averages 49°·6 all the year round; the annual rainfall is 24·2 inches, and the average number of rainy days is 165 per annum.

The annual values of the meteorological elements exhibit greater differences among themselves than might be expected.

The minimum annual value for pressure was in 1872, when it was remarkably low, and this year had the greatest amount and frequency of rain; the resultant wind was more southerly than usual, and its force greater; the temperature was about 1° above the average, and there were very few clear days.

The year 1866 had also a low mean pressure with frequent and copious rain, the most southerly and strongest resultant wind, though the temperature and weather were nearly normal.

Oddly enough, the high mean pressure of 1864 is the maximum of the series, though merely a trifle above that of several other years; and this is the year which had the least frequency and amount of rain, and the resultant wind was more northerly than usual, with the minimum force. The temperature was below the normal, especially at night. It was the driest year, and had much fine weather.

The years 1863, 1871, and 1870, had high mean pressures, with rainfall below the normal amount and frequency. 1863 had a strong resultant wind more southerly than the normal; whilst, in accordance with what seems to be the rule, 1871 and 1870 had the most northerly wind resultants, with force below the normal. The weather of 1863 appears to have been more misty than that of 1871 or 1870.

The year 1868 had the highest temperature and apparently the finest weather, with deficient pressure and rainfall, resultant wind southerly and strong.

The year 1864 had the lowest temperature, and, as we have seen, is a contrast to 1868 in respect to pressure and wind.

Referring to Diagram No. 1, it will be seen that the curve for amount of rain and also that for frequency of rain, rise and fall to the fall and rise in the barometric curve. The pressure is therefore a function of the rainfall, though doubtless controlled by other variables, particularly the direction and force of the wind.

Results of Meteorological Observ…

Year.	Barometer.	Temperature.			Rainfall.		Not…
		At 9 a.m.	Max.	Min.	Amount.	Days.	b.
	In.	°	°	°	In.		
1861	29·980	49·9	56·9	45·0	—	—	49
1862	29·947	50·5	55·8	45·6	25·67	179	29
1863	29·992	50·6	58·3	44·6	20·29	150	33
1864	29·994	48·5	56·0	41·3	17·47	139	69
1865	29·972	50·1	57·8	44·1	29·13	164	83
1866	29·899	50·3	57·4	44·7	30·71	198	44
1867	29·975	47·8	56·7	43·7	24·36	165	56
1868	29·971	51·6	59·5	45·8	22·29	150	78
1869	29·969	50·1	57·3	44·3	23·30	159	67
1870	29·987	48·3	57·0	43·1	20·47	147	59
1871	29·992	48·2	57·0	43·3	23·63	157	64
1872	29·811	50·5	58·4	45·5	31·14	211	32
1873	29·964	48·4	56·4	43·8	21·86	166	46
Means	29·958	49·6	57·3	44·2	24·20	165	55

Observations of Wind at 9 a.m., refer…

Year.	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.		S…
	O.	F.*	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.
1861	16	2·4	12	2·9	22	2·1	16	2·4	27	2·1	9	2·3	7	1·6	8	1·8	28
1862	24	2·5	17	2·9	23	2·6	8	3·5	15	2·7	10	3·5	17	2·5	10	3·2	19
1863	11	2·6	5	3·2	13	2·4	4	4·2	22	2·4	5	3·0	14	2·5	15	3·1	15
1864	22	2·0	17	2·5	31	2·8	26	2·7	45	2·6	9	2·5	11	1·6	5	2·6	12
1865	23	3·3	13	1·8	44	2·5	14	1·9	46	2·3	7	1·7	5	2·0	2	2·0	20
1866	26	2·1	5	2·6	14	2·8	20	2·7	35	2·3	3	2·3	4	2·0	3	3·7	22
1867	36	2·5	12	2·1	17	2·6	19	2·5	29	2·4	1	4·0	—	—	4	1·5	21
1868	25	2·4	18	2·7	32	2·2	8	1·8	46	2·0	1	1·0	2	2·5	2	2·0	17
1869	26	2·0	11	2·3	24	2·2	18	2·2	49	2·4	2	1·5	1	2·0	3	2·0	17
1870	28	2·0	11	2·2	35	2·6	18	2·6	52	2·5	3	1·7	2	2·0	1	2·0	13
1871	29	2·3	8	2·8	42	2·9	20	2·7	37	2·7	4	1·5	8	2·2	1	1·0	14
1872	32	2·5	5	3·0	18	2·5	6	2·7	15	2·3	3	3·3	13	2·0	6	2·3	32
1873	26	2·3	10	2·9	36	2·5	12	2·7	35	2·3	2	4·0	5	1·8	3	2·0	16
Means	25	2·3	11	2·6	27	2·5	14	2·6	35	2·4	5	2·5	7	2·1	5	2·5	19

* O signifies the number of observations; F, the mean of their forces.

irteen Years in London.

ther at 9 a.m.			Notations of Day's Weather.					
m.	f.	r.	b.	c.	o.	m.	f.	lt.
57	34	45	22	218	125	63	12	14
80	20	40	16	202	147	83	21	4
52	18	30	22	209	134	71	15	7
61	10	30	37	201	128	54	11	4
52	13	39	81	143	141	47	9	12
34	13	48	34	153	178	47	8	4
17	8	35	30	158	177	27	9	10
24	4	25	64	173	129	27	8	5
41	8	30	38	165	162	28	7	6
40	13	29	50	162	153	31	7	8
63	7	26	38	122	205	35	5	5
58	10	40	23	181	162	27	4	14
36	10	22	32	157	176	42	15	5
47	13	34	38	173	154	45	10	8

its, with mean force (by Scale 0 to 12).

...	SW.		WSW.		W.		WNW.		NW.		NNW.		No. of Calms.	Resultant.	
F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.		Direction.	Force.
2·9	38	3·1	25	3·1	48	2·5	20	3·7	42	2·4	22	2·5	10	S 86° W	0·8
3·5	56	4·1	17	3·7	50	3·3	18	3·3	39	3·4	19	2·8	12	S 85 W	1·0
3·7	49	4·3	26	3·3	51	3·2	22	3·0	51	3·3	23	2·9	12	S 76 W	1·4
4·1	37	3·3	41	3·2	53	3·4	15	3·0	9	2·1	10	2·9	13	S 88 W	0·5
3·0	49	4·3	34	4·0	53	3·1	13	3·2	14	2·9	6	2·5	11	S 81 W	0·8
3·8	43	4·3	61	3·3	75	3·1	12	3·6	15	3·3	2	1·5	11	S 71 W	1·4
2·2	32	3·5	48	3·6	85	2·6	12	2·4	14	2·4	9	2·2	13	W	1·0
2·9	42	3 7	41	3·8	101	3·1	2	3·5	5	3·4	1	1·0	8	S 78 W	1·2
3·0	24	3·6	46	3·8	101	3·2	8	3·5	12	2·8	8	3·4	8	W	1·1
3·7	22	2·5	35	4·1	84	2·8	11	3·9	14	2·9	8	3·6	25	N 67 W	0·7
3·0	26	3·6	41	3·9	80	3·2	9	2·9	13	2·7	3	4·3	25	N 81 W	0·7
3·7	52	3·1	45	3·6	72	2·6	9	3·0	10	2·9	10	2·9	22	S 74 W	1·1
2·5	34	3·4	31	3·5	102	2·8	4	2·8	11	2·8	3	2·0	23	W	0·9
3·3	39	3·6	38	3·6	73	3·0	12	3·2	19	2·9	9	2·8	15	S 84 W	0 95

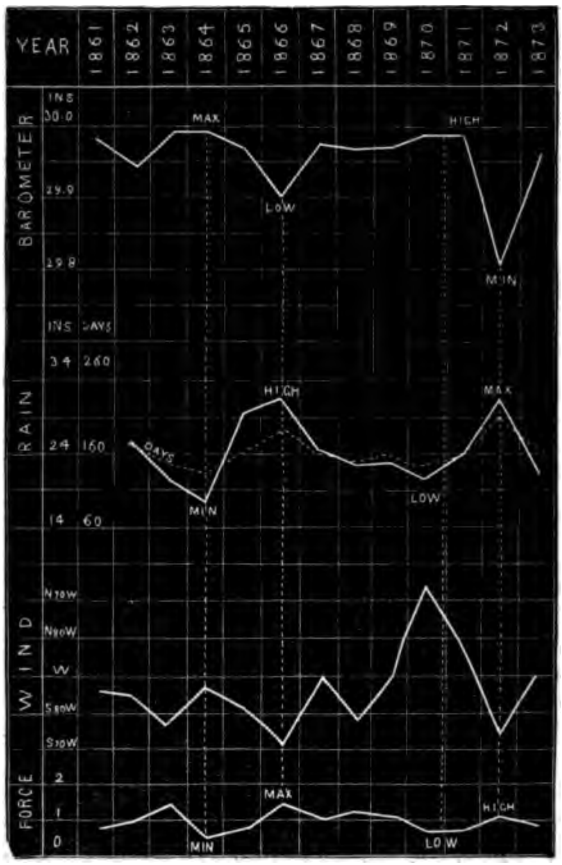


FIG 1.

On the whole it seems that:—Excess of pressure accompanies deficiency of rainfall, slow translation of the air from the north of west, and fair weather. Deficiency of pressure accompanies excess of rainfall, rapid translation of air from the south of west and foul weather. If meteorological science could give prescience of the annual value of any one of these elements, the others could be predicted with considerable accuracy.

In Diagram No. 2, the mean annual wind-rose is constructed according to Captain Toynbee's plan. The outer annulus contains the number of observations on each of the sixteen points of the compass, the inner annulus the mean force of these winds by Beaufort's scale, to one decimal place. The arrow extending to the centre shows the most frequent wind; the other arrows are in length proportioned to their frequency; the curve, trace, or web, shows the mean force, in miles per hour, every five miles being represented by 0·1 inch, measured from the arrow-tail. The ratio of the shaded segment to the entire circle is the same as that of calms to winds.

FIG. 2.

The mean force by Beaufort's scale I have converted into miles per hour, by the following equivalents: Force 2=10 miles, 3=15, 4=20.

The summary of the wind observations and grades of force may be found useful.

Direction.	Observations.	Total Force.
N	324	762
NNE	144	369
NE	351	886
ENE	189	486
E	453	1072
ESE	59	149
SE	89	188
SSE	63	159
S	246	602
SSW	159	519
SW	504	1851
WSW	491	1778
W	955	2829
WNW	155	500
NW	249	731
NNW	124	347
Calms	193	
Total	4748 days.	

DISCUSSION.

Mr. SYMONS remarked on the agreement of the rainfall recorded by Mr Strachan with that given by Mr. Dines; and singularly enough, not only did Mr. Strachan's mean value come out veiy near the truth, but his extreme values also agreed very fairly with what might be called the theoretical extremes. It was usual, as a rough rule, to say that the driest year would be two-thirds of the mean, and the wettest twice the driest. Taking the mean at 24·2 in., the theoretical maximum would be 32·3 in., and the minimum 16·1 in.; the actual figures were 31·1 in. and 17·5 in. respectively, both being within the computed limits, as they ought to be, considering the shortness of the period. He had made a comparison of the temperature at 9 a.m., with the mean maximum and minimum. He thought the mean of the maximum and minimum should be in excess by 0°·6. Mr. Strachan's figures gave a difference of 1°·1; this, however, was not constant, the difference for the first few years being small, but since 1867 it exceeded a degree. He should, therefore, like to know if any alteration had been made in the position of the instruments between the years 1866 and 1867. He also noticed the close agreement of the mean barometer reading given by Mr. Strachan, 29·958 in, with the adopted average for London for a great number of years, viz. 29·955-in.

Mr. DINES said he understood Mr. Strachan to say that the average rainfall was 24·2 in., and that it agreed with his average. If he referred to his (Mr. Dines's) table, he would find the average to be 24·55-ins. for the 60 years. It was true the table was divided into two periods of 30 years each, and he might now say that he preferred the average of the last 30 years, as being the more correct, viz. 24·2 ins. to 24·3 ins. There were so few records of rainfall for the earlier years of his table, that he could not afford to dispense with that of Greenwich, otherwise he should have been glad to have done so. The amount of rainfall he had given in the earlier years was much influenced by the Greenwich records; and he must say that he had no confidence whatever in the early years of those records.

Mr. GASTER said he was glad that in the summary of the weather experienced, the condition of the sky had always been given by the letter "*b*," "*c*," or "*o*." It is not sufficient merely to enter the letters, "*t*," "*l*," "*f*," &c. in entering observations of weather, as little or no definite idea can be formed from these of the aspect of the sky at the time of observation.

Mr. STRACHAN said that for many years the observations were made as near

as could be at 9 a.m.; latterly, however, they had been made earlier, varying between 8.30 and 9 a.m. If this caused the variations in the differences between the means at 9 a.m. and the medium temperatures, well and good; he could give no other explanation. As regards the mean atmospheric pressure, he had only to state that it was carefully, and he believed correctly, deduced. His mean yearly rainfall agreed very closely with that deduced for London by Mr. Dines, as did also the months ot maximum and minimum falls. The method of working up the notations of weather was similar to that adopted in the Meteorological Office, and he trusted that it would meet with careful attention from meteorologists, as it appeared to answer very well. He thought it necessary that the resultant winds should be given in correlation with the mean barometer readings. There could be no doubt but that the statical pressure of the air at any place was related to its dynamical pressure. It follows, therefore, that it is just as necessary to deduce the mean movement of the wind for a given period of observation, as to calculate the mean pressure of the air. Indeed, he had, for many years, thought it a great anomaly that meteorologists should treat the winds on an entirely different system to the other meteorological elements. If they required mean pressures, mean temperatures, and mean rainfalls, they should have mean wind resultants to accompany them, for the same place and the same time, and the wind must be observed for force as well as direction; moreover, the direction should be observed nearer the truth than to the quadrantal points. He had endeavoured to enforce this lesson throughout these papers, at the sacrifice of a vast amount of labour in the calculations. Finally, he tendered his best thanks to the Society for publishing these papers.

XXXVI. *Notes on Sea Temperature Observations on the Coasts of the British Islands.* By Robert H. Scott, F.R.S.

[Received February 15th. Read April 21st, 1875.]

The influence which the Temperature of the Sea on its coasts exerts on the climate of a country need hardly be insisted on before the Meteorological Society, and it is an eminently practical question which has first set the ball rolling which I propose to put on the table this evening. This question is simply this:—

Does the Temperature of the Sea affect the take of fish on the coasts?

I shall first say a little on this subject, and then proceed to explain what we are doing, independently of the actual investigations destined to furnish a reply to the question just stated.

Nearly 20 years ago, in 1856, Prof. Buys Ballot, one of our Honorary Members, issued thermometers to the Dutch herring boats, and supplied them with forms for the entry of the temperature, and of the take of fish, with some other particulars.

A paper containing the results for 1856 was published in 1857, and an English translation of it was issued by Admiral FitzRoy in 1858. The Dutch Institute, however, has not continued this inquiry, mainly, as I understand, on the ground of the insufficiency of the material collected to form the basis for scientific reasoning.

At the end of 1872, the Marquis of Tweeddale re-opened the subject by a letter to the Council of the Scottish Meteorological Society, in which he pointed out the desirability of attempting to throw light on the movements of the herring on the coast of Scotland; and the Society, which has for many years past had observations of Sea Temperature taken at several of its coast

stations, which have furnished the material for the valuable papers in its Journal which are familiar to most of our Fellows, at once appointed a Committee, which has already published two reports, and presented a third to the last half-yearly meeting, held on the 10th of February last.

As soon as the first of these reports appeared, an article was printed in the 'Shipping Gazette' for April 12th, 1873, urging the importance of Observations of Sea Temperature, and of the presence of fish, &c., on all sailors. A few days previously to this date, the following letter had been addressed to the Secretary of the Board of Trade, and by him it was forwarded to the Meteorological Committee. The author, Capt. Thos. Moore, was, I believe, the writer of the article in the 'Gazette.'

"SHIPS' LOGS AND THE MIGRATORY HABITS OF FISH.

"4 Canterbury Terrace, Catford Bridge, S.E.,

"April 5th, 1873.

"Sir,

"The supply of fish as an article of diet, and the employment of so large a population in fishing pursuits, makes it highly necessary that more attention should be bestowed on the migration of the various species of food-supplying fishes. Very little is known at present as to where herrings, mackerel and pilchards go, or from whence they come. If our fishermen wish to track them or to anticipate their advent, they do not, as a rule, know where to look for them.

"With regard to the herring more particularly, I believe it to be quite possible to trace their passage to and from certain spawning grounds, and along given lines of temperature.

"During a seven years' cruising in the Pacific, I often passed through shoals of herrings, and what struck me forcibly on the last cruise, when the vessel was homeward bound, was the fact that we had met with those fish in about the same latitude and longitude, at different periods of time, but nearly always in the same localities at different seasons. I then regretted not having made notes of the migratory habits of the herring, from my own experience; and believing it to be quite possible, in process of time, to prepare charts showing the passage of shoals of fish along the ocean, into and out of deep water, and their spawning beds, I invite the attention of the Board of Trade to this subject. If the Lords Commissioners of the Admiralty would cooperate, the work would be better completed. All that is necessary is the issue of a circular to commanders of all ships to furnish information through the medium of their log-books. Most masters will take a pleasure in entering memoranda of this description; and in examining the log-books, for the extraction of meteorological data, observations respecting fish might be collated, and a Fishery Chart compiled therefrom.

"The navigator may not desire to learn much about the passage of fish, but it should be borne in mind that fishing employs men in the navigation of vessels, and is a nautical and commercial pursuit. That trade might give employment to many more seamen and fishermen, to the advantage of fish

consumers, if it were better known where fish might be found at most seasons of the year.

"I remain, &c.,
"(Signed) THOS. MOORE.

"T. H. Farrer, Esq., Secretary,
Board of Trade."

As soon as this letter arrived, I requested Capt. Moore to call on me; but he has never made his appearance, and the only independent contribution to our knowledge of the subject has been the following letter from Mr. Frank Buckland, one of H.M.'s Inspectors of Salmon Fisheries, to Sir Charles Wheatstone, which, although it has but a very slight relation to meteorology, may still find a place in this paper, instead of remaining buried in the unpublished Minutes of the Meteorological Committee.

"Salmon Fisheries Office,
"4 Old Palace Yard, May 14th, 1873.

"My dear Sir Charles,

"I am much obliged for your kindness in communicating to me the general effect of Capt. Moore's letter, sent by the Board of Trade to the Meteorological Office.

This Office has now an opportunity of conferring very great services to the fisheries of this country. I would classify these as follows :—

1st.—Deep-sea fisheries.
2nd.—Oyster fisheries.
3rd.—Salmon fisheries.

"1.—The deep-sea fisheries. The migrations of all fish are much regulated by temperature. Herrings and pilchards and mackerel live, I believe, when not in a spawning condition, in the deep valleys formed by irregularities of level in the deep ocean. They do not approach the land as a rule except to deposit their ova, which in my opinion require comparatively shallow water to develop them; but whether this shoal water is hotter or colder than the deep sea is a fact that the Meteorological Office should endeavour to find out. For this purpose, I should propose that the following stations should be chosen: on the East coast, Wick, Montrose, Grimsby, Yarmouth, Ramsgate. On the South coast, Brighton, Portsmouth, Plymouth, Falmouth. On the West coast, Barnstaple, Swansea, Pembroke, Holyhead, Maryport, Ardrossan, Oban.

"The daily temperature of the sea should be taken by a self-recording thermometer at the pier-head at each of these places. I should propose at 12 mid-day and 12 midnight. The temperature of the air should also be taken, and also readings of the barometer and ozonometer, as I believe fish are very sensitive to ozone. Every opportunity should be taken to get temperatures from the fishermen, who should take them at or near the legal three-mile limit (*see* Sea Fisheries Act), and again when they arrive actually among the herrings, pilchards, mackerel, &c.

"Soles and cod are also migratory in May. The soles go over to the coast of Heligoland to spawn. In the winter they are found dispersed on the sand-banks between Norfolk and the coast of Holland. I should like to know the temperature at the top and bottom of the water agreeable to the soles in their winter residence, and also the same in the summer when they are spawning.

"The cod live at and about the Dogger Bank in the winter. In February and March they come nearer in shore to spawn; in June, July, and August they go towards Iceland, where the fishers follow them with their nets. I should like the Meteorological Office to follow them with their thermometers.

"2.—As regards oyster fisheries I myself first started the idea, which I have proved to demonstration by experiments in a small sea laboratory near Herne Bay, that although young oysters are born in millions every year, yet if the thermometer sinks during the time the young spat are in a swimming state they all or nearly all perish. If, however, the water rises to a certain point and remains there, from 15th June to 15th July or thereabouts, a valuable crop of young oysters will be procured. I have already published, in "Land and Water," records of temperature of several oyster fisheries.

"Temperatures should therefore be taken of oyster fisheries during February, March, April, May, June, July, August, and September at the following places: Whitstable, Herne Bay, Paggleshan (Essex), Colchester, Ipswich, Medina River (Isle of Wight), Brading Harbour, Falmouth, Swansea, and Milford. Those are the chief oyster beds in England. The temperatures obtained should be carefully compared with temperatures taken in France at the Isle of Ré, Obéron and Arcachon; also with that of the oyster beds at the mouth of the Tagus at Lisbon. The reason the French succeed so well with their artificial oyster breeding is solely that the temperature is higher.

"3.—As regards salmon fisheries the Meteorological Office would indeed assist this vast and important national industry very much by obtaining temperatures.

"The facts are about as follows: all salmon spawn about Christmas week; yet some rivers are 'early' some 'late.' Thus, in the Tay, Severn, Tyne, Dee, and Eden 'fresh run' fish appear in February, and they get red, out of condition, about August, when the present close season begins.

"There is a second class of rivers, such as all the small rivers in Wales and Devon, and rivers from the Conway round the coast to the Exe (the Usk and Wye excepted), where the early 'clean run' do not appear till May and June.

"The latest rivers in England are the Fowey and Camel in Cornwall. Meteorological observations would, *I am sure*, solve the difficult problem of the reason why salmon run up some rivers earlier than others; and if we could obtain this information, owners of the salmon fisheries would be under the greatest obligation to the Meteorological Office, while, at the same time, the Parliament would be much assisted in framing future laws on the subject.

"I should propose, for example, that the daily temperature of the Tay should be taken at the exit of Loch Tay (at Killin Bridge), at Perth Bridge, and at Dundee. The fisheries of the Tay are worth from £16,000 to £17,000 per annum.

"The Spey and the Forth should be tested at places I could indicate. The Chester Dee at the locks belonging to the Shropshire Union Canal Co., at the exit of Bala Lake, at Llangollen, at Chester Bridge, and at Connah's Quay in the estuary. The Severn should be tested at the estuary, at Portskewet, at Newnham, at Worcester, at Shrewsbury and Newtown. The Ribble at Preston and Clitheroe. The Wye at Chepstow and Builth. The Usk at Newport, Ross, and Brecon, &c. &c.

"The advantages which, I feel sure, would be derived from the results of such observations, would be that an immense saving of wear and tear of boats and tackle would be made by fishermen, who would be warned that if the temperature went over a certain point the fish would not run, and if it fell to a certain point they would run, or as the case may be.

"When in Scotland, I told the owner of a certain stake net that if the temperature fell to a certain point his nets would not fish; if it rose above a certain point, they would fish. I subsequently heard from this gentleman that the facts proved my theory correct.

"Thus, then, it will be seen that the Meteorological Office are in a position to erect guide-posts for the deep-sea, oyster, and salmon fisheries, and I sincerely trust that they will be patriotic enough to set these observations on foot at once. Even though the experiments be carried out on a small scale, and with comparatively rude instruments, I feel sure that before the end of the year some light or other would appear amid the present obscurity which surrounds the question of the 'Effects of the temperature on the migrations of fish both in sea and river,' and also on the breeding of oysters.

"I need hardly say that I shall be glad either in my official or private capacity to render the Office any assistance in my power.

"I have, &c.,

"(Signed) F. BUCKLAND,

"Inspector of Salmon Fisheries."

It is perfectly obvious that it would be utterly impracticable for the Meteorological Office to take up an inquiry mainly of a biological nature; and so I was instructed to reply to the Board of Trade, that while the Committee were perfectly ready to supply instruments to selected stations round the coasts for the observation of Sea Temperature, they could not undertake to collect data as regards the movements or the take of fish.

In fact, such investigations as were contemplated by the Dutch, and those which are now being carried out in Scotland, must be conducted in the fishing fleet itself, for it is wanted to ascertain the temperature of the water in which the fish are actually swimming at the time.

Moreover, there is no organisation, either in England or Ireland, whence we could obtain statistics of the total take each night, much less particulars of the natural history of the herring; so that even if we were prepared to undertake the inquiry, we should have had to have professed to the Board of Trade our inability to carry it out in its entirety. As to the proposals of Mr. Buckland, they would involve the expenditure of several thousands a year,

were we not only to establish stations on the coasts and on salmon rivers, but to keep a set of cutters cruising about on the various fishing grounds, whether the fishing fleet is there or not.

In fact, in my opinion, any of the methods hitherto put in practice for testing the temperature have been all insufficient. Any one who has paid attention to the subject of fishing knows that, not only do the shoals of fish move about from place to place, but that they swim at different levels on different days, so that the mere surface or bottom temperatures will not be sufficient to throw light on their movements, but we should require a set of serial soundings, so as to show the vertical distribution of temperature in the sea. There is no possible difficulty in doing this, save and except the universal difficulty in all scientific inquiries, impecuniosity of the investigators.

If, however, the attention of any of the Fellows who may live near a salmon river is drawn to the subject of testing regularly the temperature of the water, good will have been done by the above fragmentary remarks.

It is now time to leave off speaking of what we have not done, and to say what we have done, and are doing.

In the first place, I have induced some of our telegraphic reporters who are stationed close to the coast, where there is plenty of water, to take observations once a week. The only stations which have done this regularly have been those on the coast of St. George's Channel, and at Scilly, and besides I have received from one of our Fellows, Mr. W. P. Dymond, a series of means of temperature from observations taken almost daily off Falmouth Harbour.

The reason of my not being able to obtain observations from other points has been, that many of the stations are situated on tidal harbours, as Nairn, Donaghadee, or Stornoway, or at the entrances to estuaries, as Moville and Roche's Point, so that easy access to deep water is not attainable. However, I should mention that Mr. N. Whitley, who in 1868 published a paper on 'Sea Temperature' in the Journal of the Royal Agricultural Society, has sent me some temperatures from Penzance, but not for the same years as those for Falmouth.

The records commenced at Holyhead in October 1871; at St. Ann's Head a month later; at Falmouth, in January 1872; at Scilly, in June 1872; and at Kingstown, in October 1873.

The only fact related to fish movements which has come out of these observations, has been that at Kingstown a conger-eel took a fancy to a thermometer, and bit it off the line. I have not heard whether or not he suffered ill effects.

The observations were made simply by lowering a thermometer to a depth of a fathom, in water more than three fathoms deep, leaving it there for five minutes, and then hauling up and reading. This process can only be considered as giving a rough approximation to the Temperature of the Sea, owing to the rapid fall of temperature of the thermometer in its wet state during the process of hauling up to the pier-head and reading. Such as they are, however, I submit the means to the Society; but I shall not

Monthly Means of Temperature of the Sea on the West Coast of England and Wales.

Months.	Holyhead.				Kingstown.		Pembroke (St. Ann's Head.)				Scilly.			Falmouth.		
	1871.	1872.	1873.	1874.	1873.	1874.	1871.	1872.	1873.	1874.	1872.	1873.	1874.	1872.	1873.	1874.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
January	—	45.7	47.0	46.8	—	45.8	—	47.9	47.0	48.3	—	49.6	50.5	49.3	48.9	49.5
February	—	46.0	42.5	45.0	—	45.2	—	47.2	44.3	47.8	—	47.8	49.8	49.3	45.9	48.0
March	—	45.8	44.3	44.8	—	45.8	—	48.1	45.0	47.2	—	49.0	49.3	50.2	46.0	49.1
April	—	48.0	45.8	48.2	—	49.4	—	49.6	47.0	50.1	—	50.8	51.6	50.9	48.8	51.7
May	—	49.8	49.4	52.3	—	52.8	—	51.2	51.4	52.5	—	53.6	53.8	52.0	50.7	54.0
June	—	54.7	58.5	55.5	—	57.4	—	54.5	54.2	56.2	55.5	56.5	54.8	55.1	54.2	57.1
July	—	58.0	59.5	58.6	—	59.4	—	59.4	57.7	59.2	58.0	58.6	59.8	60.3	56.9	60.2
August	—	60.4	59.6	60.0	—	59.6	—	60.9	60.0	60.5	60.2	58.8	59.8	61.6	57.8	58.2
September	—	60.0	57.8	58.3	—	57.6	—	59.8	58.5	59.5	58.8	57.5	58.5	59.6	56.6	58.2
October	54.8	53.8	55.8	56.2	52.0	55.4	—	55.7	55.5	57.4	55.2	55.8	55.8	55.4	56.2	56.2
November	50.3	50.3	49.6	52.5	47.6	51.0	51.9	52.0	51.8	53.5	52.0	52.8	53.5	52.7	51.9	53.7
December	46.5	47.4	49.4	46.0	47.7	45.0	48.1	49.8	52.3	47.8	50.3	51.6	49.0	50.3	51.3	48.8
Year	—	51.7	51.6	52.0	—	52.0	—	53.0	53.5	53.3	—	53.5	53.8	53.9	52.1	53.7

proceed to discuss them further, excepting to say that the actual readings for the three stations on the west coast of England and Wales, and for Kingstown opposite, show a satisfactory accordance in their indications as

regards the regular rise of temperature in the months of May and June, and its fall in those of October and November.

There are some striking non-periodic variations, especially in the middle of November 1873, when a most unusual fall of temperature occurred in the sea at Holyhead, lasting for eleven days from the 11th to the 22nd, when the temperature was taken almost daily, the observer's attention having been attracted by the anomaly in the readings. This depression was also observed, but not so minutely, both at Kingstown and St. Ann's Head; and for the same period, but not to the same extent, at Scilly.

An examination of the Daily Weather Reports for the period has not shown any concomitant depression of air temperature which might have produced a surface cooling.

The actual figures were as follows:—

	Holyhead.	Kingstown.	St. Ann's Head.	Scilly.
	°	°	°	°
Nov. 10	...	...	51	...
11	50	47	...	...
12	47	...	...	...
13	47	...	...	52
14	47	...	...	...
15	48	...	...	...
16	49	46	...	...
17	50	...	50	...
18	50	...	...	...
19	51	...	...	...
20	50	...	...	52
21	49	48	...	...
22	50	...	...	...
23	...	...	...	...
24	50	...	52	...
25	50	...	...	...
26	50	55 ?	...	...
27	50	...	...	...
28	50	...	...	53

These facts, are however, sufficient to show that much interesting matter is to be obtained from systematic observations of Sea Temperature.

There are many reasons for wishing to have observations from the open sea in lieu of those from mere coast stations; and the Reports of the Scottish Committee, to which allusion has already been made, show how the observations taken *e.g.* in Peterhead Harbour have differed from those made in the offing, where the boats were actually fishing.

Accordingly, when we received the letter from the Board of Trade which I mentioned at the commencement of the paper, we addressed ourselves to the three Lighthouse Boards, in order to have observations made in the first instance at selected lightships, and secondarily, at lighthouses on those parts of the coast where no lightships exist. This embraces the entire north coast

of Great Britain from the Humber round to the Isle of Man, and the entire Irish coast, with the exception of the comparatively small district from Dublin to Cork.

We at once received the most cordial support from the Trinity House and the Commissioners of Irish Lights; but the Commissioners of Northern Lights intimated their entire inability to render any assistance owing to the fact of their having no lightships.

The two Boards first mentioned, stated that they must for the present decline to have observations taken at lighthouses, inasmuch as at those situated on exposed parts of the coast it is often, for months at a time, a dangerous matter to approach the sea so closely as to take the temperature, and the lighthouses are not provided with boats.

However, the Trinity House have consented to have the temperature taken at the Farn Islands Lighthouse, so as to get some information from the north-east coast of England.

The lightships which are now about commencing the work of observing are twelve in number:

Dudgeon Leman and Ower Galloper South Sandhead Owers Sevenstones Morecambe Bay Bahama Bank	England.
Kish Arklow South Coning Beg Daunt's Rock	Ireland.

To each of these we have supplied two thermometers, one for sea temperature, the other for that of the air, and a Six's thermometer with unprotected bulb for taking the temperature at the bottom. It was not thought necessary to protect the bulb, as the depth of water is never great.

The observations are to be taken daily at noon, and it is hoped ultimately to add to them some observations of the Specific Gravity, but we shall first see how the simpler observations turn out.

It may, however, be of interest to see what is being done elsewhere on this subject. The Germans have not been neglecting it, and have constituted a commission for the scientific examination of the German seas, which has its habitat at Kiel. Among the first, if not the very first instigator of this enterprise has been Dr. H. A. Meyer, who has himself devoted much of his time and his money to the inquiry. Dr. K. Möbius, Dr. G. Karsten, and Dr. V. Hensen are associated with him in the Commission, which is carried on under the auspices of the Ministry of Agriculture at Berlin.

The scope of the undertaking is very extensive, inasmuch as it embraces

not merely the physical conditions of the sea, as regards its temperature, specific gravity and salinity, but also all biological investigations connected with the fauna and flora which inhabit it, so that its inquiries go far beyond the mere movements of fish, and are about co-extensive with those of our own 'Challenger' expedition.

The Commission has already published a Report for the year 1873, containing an account of an expedition in the German despatch boat 'Pomerania,' to carry out soundings and temperature observations in the Baltic. Besides this work, Dr. Meyer has published a volume of investigations into the physical conditions of the western portion of the same sea. Both these works are issued in a very handsome style, and are copiously illustrated.

It is very much to be desired that our own Government would institute a similar inquiry on our own coasts; or if they wished it to be conducted by the Meteorological Office, that they would give us special funds to secure the assistance of able naturalists, as well as physicists and chemists. Were we in a position to institute inquiries along our eastern shores on the same scale as the Germans are doing on their coasts, we might have a chance of throwing light on the actual circulation of the water within the comparatively closed area of the North Sea, in the same way as we see Dr. Meyer has begun to do for the lower portion of the Baltic.

DISCUSSION.

Mr. Dines said that he was obliged to Mr. Scott for bringing the paper before the Society, as it was interesting to the naturalist; and considering how much our climate was affected by the water by which we are surrounded, it must be interesting to the meteorologist. He hoped these observations would be continued, and that Mr. Scott would also be able to give us a daily maximum and minimum temperature. Some five years ago he had made observations of the temperature of the water in a river. The box in which the thermometers were placed had a weight attached to it, and it depended very much upon the strength of the current whether the thermometers were a few inches more or less below the surface. From what had occurred since, he was of opinion that if the thermometers had been sunk in deeper water, very different results would have been obtained; and he had no doubt that fish could accommodate themselves to a considerable change of temperature by keeping nearer to or more below the surface. His attention had again been called to this subject from his having erected a large tank to determine the amount of evaporation. That tank was banked up with earth, and it became a matter of some interest to know how much the temperature of the water in the tank differed from that of a pond 8 feet deep, to which he had access. One morning, after a sudden frost, the pond was covered with ice; but on breaking the ice to obtain the temperature of the water beneath, he was much surprised at not being able to get a lower reading than 39°. He had since found the water in the tank to be 32° on the surface, while it was 39° at 2 feet below; and on last Saturday (April 17th), with the sun shining, the surface of the water was 68°, at 4 inches below it was 57°·5, and at 2 feet below, 44°; on stirring up the water with the thermometer, he brought the surface temperature to 53°, but in four minutes afterwards it was again up to 66°. This was in still water, and might be called an extreme case; but in a quiet sea, he thought the same thing would take place, but in a less degree, and, therefore, great care and uniformity would be required, in order that observations made at distant places might be compared with each other. As to the *surface* temperature, when the day was cloudy and no sun shining, the surface of the water was rather below the temperature of the air; this he attributed to the cold produced by evaporation; but when the sun was shining, the surface of the water was warmed

up considerably above that of the maximum temperature in the shade, as shown by the thermometer in the stand. As to the minimum temperature of the surface, the water for the last eight mornings had averaged 41°·5, while that of the air was 32°·2. His attention had not been called to this question sufficiently early, and he must wait for another winter to determine how low the temperature sunk. He was inclined to think that water would be found to be a good radiator, as he had noticed thick ice upon the surface of the water in the tank, while the temperature in the stand had not been below 33°; at present the water was above 39° below, and as the surface cooled, the water sank, which would not be the case when the water was at 39° below. As to the maximum and minimum temperatures at some depth below the surface, he had tried to take them, but could not succeed. As long as it was certain the water was coldest below, a minimum could be obtained, but not the maximum; and the contrary when the water was warmest below. He had occasionally, but very rarely, noticed that water (all above 39°) would be 2° warmer a few inches below than it was at the surface, and his remarks now applied to deep-sea temperatures. He could easily conceive that water melted from icebergs and snow, being of less density, would float upon water of a much higher temperature. Any one could easily satisfy himself upon this point by putting salt into warm water; it would remain for a considerable time under fresh water twenty degrees lower in temperature.

Mr. Pastorelli thought that water of the temperature of 38°·8 might be below the surface of a stratum of 35°, as that was its greatest density. Some special thermometer was required for taking the temperature of water at varying depths, and he believed Negretti's new thermometer would answer very well, provided the mechanism would work satisfactorily.

Mr. Symons said that they had had the same irregularities in the temperature of the water in the Strathfield Turgiss experiments; but though there were great differences between the temperature at the surface and 1 foot below, he was not prepared for so large a difference as that observed by Mr. Dines. With respect to the change of the self-registering thermometers, they were hauled up very quickly, so as not to give them time to change their readings. He thought that no observations of sea temperature should be taken in a harbour or close to the shore, but out at sea. If Mr. Buckland's theory that oysters require warmth were correct, he should like to know why the Exmouth oyster bed was a failure, as he had understood was the case.

Mr Negretti, in reply to the President, said that his thermometer will turn over satisfactorily in 1 fathom, and can be made to turn even in less water by making the screw of sharper pitch.

Mr. Strachan thought there was no difficulty in providing suitable instruments, but it was another thing to find observers who knew how to use them.

Mr. Harrison said the temperature of the surface water would be greatly affected by the sun. As to the depth to which the solar rays penetrate the sea, he should be glad to be informed whether any thing had been ascertained on this subject.

The President said that there were observations extant bearing upon that question. The depth varied somewhat with circumstances.

Mr. Dines stated that by shading the thermometer from the sun's rays as it lay upon the surface of the water it appeared to be lowered about 1°.

Mr. Scott said that maximum and minimum thermometers with unprotected bulbs, as they were to be used in shallow water, had been supplied to the lightships; but four of them had been returned broken in as many weeks. In reply to Mr. Dines, he would say that the sea was scarcely ever in such a state of perfect calm as could exist in a cistern like that in which Mr. Dines had carried on his experiments. The observations made at the lightships were conducted by taking up a bucketful of water from the surface, in the same way as is done in the case of ships at sea. By this means the water was disturbed to a depth of from 6 inches to a foot. As regards the relation between sea and air temperature, it was very remarkable, that as far as the results at present obtained went, they showed that the sea surface temperature ranged about a degree *above* that of the air. This was true, not only for the Atlantic Doldrums, but for the neighbourhood of Cape Horn and the region of the famous Humboldt's Current of cold water on the west coast of South America, which, cold as it was, was warmer than the air. It was quite true, as Mr. Dymond had said in his Report on the

Meteorology of West Cornwall, that temperature observations taken from pier-heads were objectionable, but he had exerted the greatest caution in selecting such places, avoiding any spot to which the water from the open sea had not full access. The great drawback to all observations made by plunging a thermometer in the sea was, that when taken out its bulb was wet, and it at once lost heat by evaporation.

Mr SYMONS inquired whether M. Janssen's thermometer, which has the bulb surrounded by tow, would obviate the difficulty.

XXXVII. *Errors of Low Range Thermometers.* By FRANCIS PASTORELLI, F.M.S.

[Received March 17th. Read April 21st, 1875.]

IN Canada, mercurial thermometers have been found with errors in their minus readings, varying in extent from 2° to 3°. I allude to those that have been verified at the Kew Observatory with small given errors in their range from 32° to 92°.

I was requested by Professor Kingston, of the Magnetic Observatory, Toronto, to make some very accurate low range thermometers, which were to be tested at Kew at —37°·9; the freezing point of mercury. To obtain accuracy, I decided upon calibrating the tubes, as no intermediate fixed points up to the present time have been given, by which they could be pointed off; nor is there any recognised system by which they could be marked by comparison with a Standard between +32° and —37°·9.

Thirty-four thermometers were made from the usual kind of tubes, which I calibrated, and carefully divided, and then sent to Kew.

In the range from 32° to 92° they had very small errors, and I concluded the minus readings would be equally satisfactory.

The errors given at —37°·9 by Kew comparison were as follows:—

1	had error	... ...	° 0·0
8	,,	... ...	0·1
2	,,	... ...	0·2
3	,,	... ...	0·3

The other twenty had errors 0°·5; 0°·7; 0°·9; a few 1°·0; in three cases only was the latter exceeded; the one with the greatest error reaching 1°·8.

These latter results surprised me, and I entertained doubts as to the accuracy of my work; more especially, as I have invariably found the errors given by Mr. Baker to exist. That gentleman told me that having found the errors small in the range from 32° to 92°, he was induced to twice test them at —37°·9, and in both instances the results were identical.

I determined to test again by calibration the three thermometers which were found to have the greatest errors, viz.—

No. 13	had an error	+ 1°·2	at	— 37°·9.
,, 19	,,	+ 0·8	,,	,,
,, 31	,,	+ 1·8	,,	,,

I found by calibration that

No. 13 had an error only	$+ 0^{\circ}\!\cdot\!2$	at	$- 37^{\circ}\!\cdot\!9$.
,, 19 ,,	$+ 0\cdot1$	,,	,,
,, 31 ,,	$+ 0\cdot2$	,,	,,

Mr. Baker having expressed a wish that these three thermometers should be returned, so that he might test them by the same process, found similar errors.

It is rather singular that No. 31, which has the great error $+ 1^{\circ}\!\cdot\!8$ at $- 37^{\circ}\!\cdot\!9$, should have no error in its range from 32° to 92°, and Nos. 13 and 19 only $0^{\circ}\!\cdot\!2$.

It is clear in the case of the three thermometers Nos. 13, 19, 31, that they are correct within $0^{\circ}\!\cdot\!1$ and $0^{\circ}\!\cdot\!2$ by calibration, and incorrect by experiment $0^{\circ}\!\cdot\!8$, $1^{\circ}\!\cdot\!2$ and $1^{\circ}\!\cdot\!8$ at $- 37^{\circ}\!\cdot\!9$.

These errors must arise from one or two causes,—the difference in the expansibility of the glass or the mercury, or both conjointly. I can certify that all the thermometers had mercury of the same density, it being taken from one bottle;—this being the case, I conclude that its expansions and contractions would be uniform. With respect to the glass tubes, I cannot say that they were made from the same pot of vitrification. I therefore infer that the discrepancies arose from the different kinds of glass of which the thermometers are made.

Monsieur Regnault says "that the co-efficient of expansion varies in different kinds of glass; that he has found some mercurial thermometers differ several degrees from each other between 32° and 212°, which he attributes to this cause."

Such great differences being recorded by so eminent an authority, there can be no question that they were observed, but I may add that I should neither suspect nor expect to find differences of several degrees in comparing standard thermometers with each other; for whatever the difference in the co-efficient of expansion of various kinds of glass, the divisions being made between two fixed points 32° and 212°, its expansion would be thereby allowed at any intermediate temperature, the difference being eliminated in the graduations.

I now determined to ascertain if any or what difference would arise by making the walls of balls of thermometers of a different thickness. I made two thermometers; one had its ball twice as thick as the other. By comparing these with a standard at zero several times, I could not detect the slightest appreciable difference in their readings; the only effect of thickness was to render the indications sluggish.

I thought it might be of interest and of some value to know what would have been the errors of these thirty-four thermometers if they had not been calibrated, but divided in the usual manner. Taking the results of my observations of them as a basis, I devised the following formula, by which I calculated their errors:—

Let l = mean length in calibrated tube
,, l_1 = ,, non-calibrated tube
,, n = number of degrees in l_1

To find d = difference in degrees

Then $\frac{l_1}{n}$ = length of one degree

$$\therefore d = \frac{n(l - l_1)}{l_1}$$

5 would have had an error		$0^{\circ}\!\cdot 1$ to $0^{\circ}\!\cdot 3$	at	$-$ 37·9
12	,,	0·5 to 0·8	,,	,,
11	,,	1·0 to 1·2	,,	,,
2	,,	1·5 to 1·9	,,	,,
8	,,	2·4	,,	,,
1	,,	2·8	,,	,,

Now these errors are more numerous and much greater than those given; again, they may be minus or plus, so that when they are compared with each other, they may be found to differ about 5°. For this reason, I think it desirable that all low-range thermometers should be calibrated. By adopting calibration the errors would be reduced nearly one half; the errors arising from the expansions and contractions of various kinds of glass could only be corrected by marking the thermometer tubes off at two or three points at least below 32° by comparison with a standard.

Since writing this paper, 38 thermometers not calibrated have been found by the experimental test at Kew at — 37°·9 to have errors greater and more numerous than those I have calculated, viz.:—

8 had errors from		$0^{\circ}\!\cdot 1$ to $0^{\circ}\!\cdot 2$
5	,,	0·3 to 0·4
9	,,	0·5 to 0·7
10	,,	0·8 to 1·0
4	,,	1·2 to 1·7
2	,,	2·8 to 2·9

These errors were equal in their signs, 18 being plus, and 18 minus: whereas, in the calibrated ones all were plus. There is no doubt in my mind that the errors of non-calibrated thermometers will differ very much more in their signs than calibrated ones.

Sixteen of these thermometers, when compared with each other, differed in their indications 2°·0, 3°·0, and one pair as much as 5°·9 with each other.

In conclusion, my desire is to draw attention to the subject, with the view that some gentleman may interest and occupy himself in discovering two or more fixed points below the freezing point that might be rendered available to the manufacturer, by which he could easily and readily point off thermometers by comparison with a standard; so that thermometers might be produced nearly as accurate at their low range from 32° to — 37°·9 as they are now found to be in their range from 32° to 92°. I may add also, that for a lower range we ought to have an acknowledged standard spirit thermometer constructed.

DISCUSSION.

Mr. NEGRETTI said he agreed with Mr. Pastorelli that to make good mercurial thermometers they must be done by calibration; by it correct thermometers could be made with certainty. The great difficulty was in getting correct low range alcohol thermometers, and this arose mainly from the difficulty in calibrating a large bore such as was required for spirit thermometers; and also from the fact that all makers do not use alcohol of one uniform specific gravity. It was certainly most desirable to find some fixed points below 32°, so as to assist the maker in graduating spirit thermometers. As regards the erroneous readings which mercurial thermometers were liable to give after some length of time, in his opinion, this was entirely, or in a great measure, due to the use of spherical bulbs. Prof. Regnault invariably used cylindrical bulbs, or more correctly speaking, bulbs made out of drawn cylindrical tubes. Their superiority over the spherical ones, arises from the fact that the only portion of the glass which is re-fused, or disturbed, in making the bulb, is the part which is joined to the stem of the thermometer, and the small end which is closed, or sealed up, and that forms but a very small proportion to the whole bulb. There was one thing which no investigator had yet done, viz. to take a number of mercurial thermometers and subject them to a very low temperature for a length of time, and, as it were, do the very opposite to the annealing process. He believed that thermometers so treated might be found to be unchangeable; in any case, it would be curious to see how they would read when compared with thermometers which had not been subjected to the cold process. He never found any difficulty in making accurate mercurial thermometers; it is a delicate process, but presents no extraordinary difficulties.

Mr. PASTORELLI said that the molecules of glass will, after a time, take their normal condition. If six dozen thermometers were blown by six different men, from the same kind of glass, he considered that the thickness of their bulbs would make no difference. He believed the errors of calibrated thermometers to be half those of uncalibrated ones at their minus readings.

Mr. STRACHAN said this paper might be regarded as emanating from the progress of meteorology in Canada. That climate required low range thermometers, and the wonderfully discordant indications of spirit thermometers in extreme cold had led to the requirement of greater accuracy in their graduations. Yet while there was no test below 32° F., no reliance could be placed on low readings. This led to the trial of thermometers at the melting point of frozen mercury, which had been found by Prof. B. Stewart to be — 37°·9, and to remain stationary during the process of melting. An apparatus for solidifying mercury had been supplied to the Kew Observatory many years ago, under the auspices of M. Regnault, and a few standard spirit thermometers had been pointed at —37°·9 by its means. Still, until the matter became urgent, the method of testing had not been brought to a workable plan. It remained a laboratory experiment, partly on account of its difficulty, more so on account of its expensiveness. Within the last year or so the testing had been reduced to a practical operation, which, provided a moderate number of thermometers were tried together, could be carried out at a charge of 5s. a piece. The first few batches of thermometers so tried at — 37° 9, proved to be far from correct. Their errors were commonly 5° or 6°, and even as much as 10°. This, of course, could not be tolerated; and the makers, urged on to accuracy, now made them sensibly correct, as Mr Pastorelli's paper had shown them. He deserved the thanks of meteorologists for the *con amore* manner in which he had resolved to attain, if not to excel in, accuracy. However, there was a long range from 32° to minus 38°, — that is 70°, — for which there were still no intermediate testing points. Having consulted 'Miller's Chemistry' to learn what could be done with freezing mixtures, he found it stated that two parts of pounded ice, or, better still, of fresh snow, and one of common salt, well-mixed, produce a steady temperature of — 4° for many hours; and it might be well for the makers to try this. During the 'Polaris' voyage to the Arctic regions, Sergeant Meyer found, by repeated operations, the melting point of mercury to be — 39°·8; but his thermometers had not previously been tested at that point. Those now going with the English Expedition are the first to be used in those regions of known accuracy, and will render their records greatly more valuable than those of their predecessors.

Mr. SCOTT said that it was only very recently that thermometers had begun to be tested at Kew at the freezing point of mercury; this was because solid carbonic acid had now become an article of commerce. He believed that Profs. Stewart and Roscoe had been for some time engaged upon determining another fixed point on the thermometer scale, besid s those already recognised.

Mr. WHIPPLE said that as he took part in the experiments made at Kew for determining the freezing point of mercury, he might say a few words about it. The first was he believed made in 1860, when Dr. Miller, Mr. Gassiot, and several other members of the Committee were present. All the standards that they possessed were inserted in the apparatus, and a certain result was obtained. Dr. Stewart did not consider this satisfactory, so an air thermometer was constructed somewhat on the plan of Regnault's. The freezing point of mercury was determined by this to be — 37° 9; this he considered the best result. He should like to ask Mr. Pastorelli if the thermometers had been calibrated under a microscope. As to the specific gravity of alcohol in spirit thermometers, he considered it imperative that the alcohol for best thermometers should have a certain defined specific gravity.

Mr. STRACHAN did not doubt Dr. Stewart's result, he merely thought it would be well for the Arctic observers to note the readings of all their thermometers, in mercury melting under the influence of the weather.

Mr. SYMONS believed that the desirability of an operation the reverse of annealing was referred to in a paper by Mr. Wenham, and fully discussed at the Bradford Meeting of the British Association.

Mr. PASTORELLI said the thermometers were calibrated under a microscope. He had a letter from Mr. Kingston in which he said that mercurial thermometers had errors of 5°, or 6°, that is, they differed with each other to that extent.

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

MARCH 17th, 1875.

Ordinary Meeting.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

Captain HENRY J. H. DE VISMES, Bury House, Bedford; and
MONS. HAROLD TARRY, 46 Boulevard Magenta, Paris,
were balloted for and duly elected Fellows of the Society.

The names of three Candidates for admission into the Society were read.

The following papers were then read:—

"Results of Meteorological Observations made at Patras, Greece, during 1873." By the Rev. HERBERT A. BOYS. (p. 376.)

"Ozone." By FRANCIS E. TWEMLOW, F.M.S. (p. 383.)

"On the Annual Means of Thirteen Years' Observations at London." By R. STRACHAN, F.M.S. (p. 390.)

The Meeting was then adjourned.

APRIL 21st, 1875.

Ordinary Meeting.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

Rev. C. P. PEACH, Appleton-le-Street, Malton;
ALFRED RAPKIN, 46 Hatton Garden, E.C.; and
EDWARD MASON WRENCH, F R.C.S., Park Lodge, Baslow, Chatsworth,
were balloted for, and duly elected Fellows of the Society.

The names of five Candidates for admission into the Society were read.

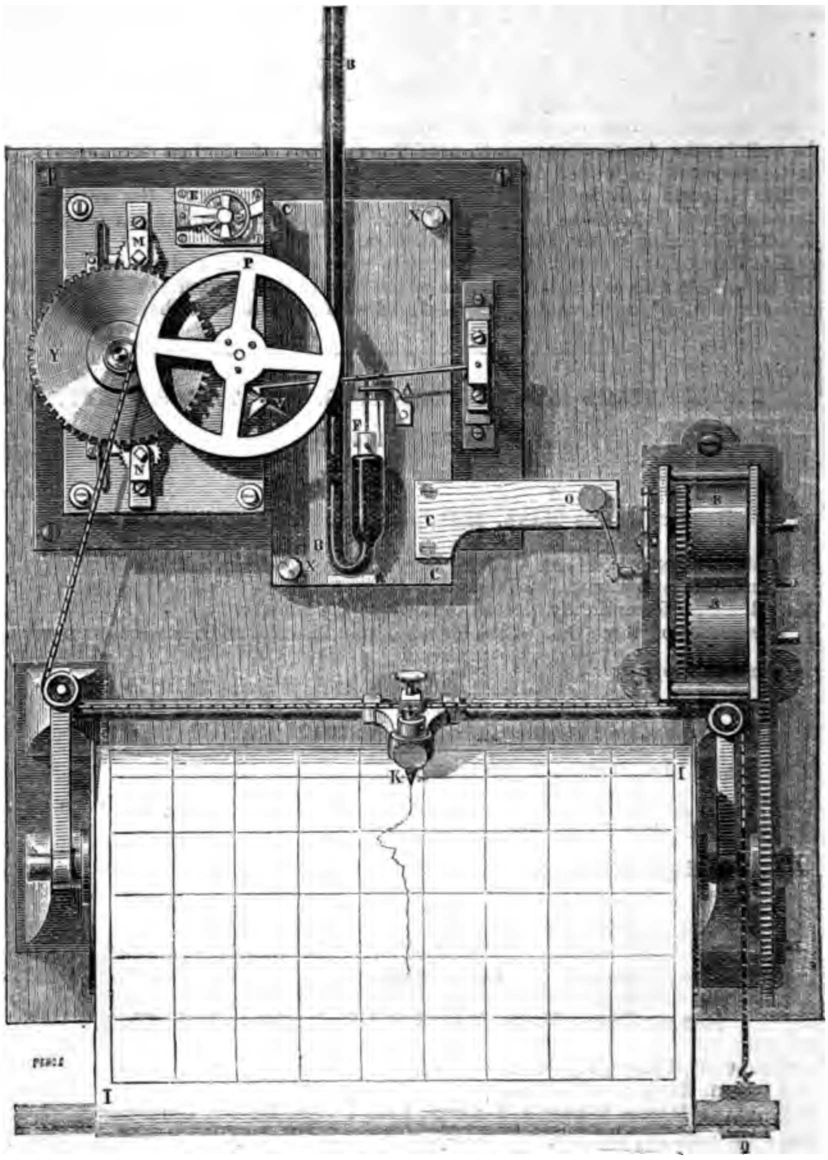
The following papers were then read:—

"Notes on Sea Temperature Observations on the Coasts of the British Islands." By R. H. Scott, F.R.S. (p. 396.)

"Errors of Low Range Thermometers." By F. Pastorelli, F.M.S. (p. 407.)

Mr. Scott exhibited a model of Dr. Wild's Pressure Anemometer.

"On a New Barograph." By M. Louis Redier. (Communicated by G. J. Symons, F.M.S.)



THE motive force of any barometer, whatever ordinary size may be given to the apparatus, is only sufficient to lift a light needle, and will not overcome the friction of a pencil upon paper. If, however, the apparatus is so arranged that all the work is done by a powerful clock movement, and the barometer has only to direct the action of the clockwork, then it is evident that there is no limit to the work which can be done.

In the instrument under notice this is the case. An ordinary syphon barometer BB is fixed to the slab CC, and supported by the two buttons XX. A small ivory float F rests on the mercury, and carries a very light vertical needle, on the top of which rests a very light arm A, which has a small ratchet at its end.

By the side of the apparatus are two clock movements, one M terminates in the chronometer escapement E, and the other N in the fly V. These two movements work in opposite directions, and are so calculated that the speed of V is at least twice that of E.

A differential train unites this double system with the pulley P, to the axis of which a cog-wheel is attached, which works in a rack on the barometer slab CC.

Now let it be assumed that the movements are wound up, what will occur?

The escapement E is constantly going, and tends to draw the pulley and the pencil K, and to raise the barometer and its slab upwards; the arm A, pushed by the needle F, follows the movement, when the ratchet releases the fly V, and allows it to revolve. The speed of V being twice that of E, the movement N immediately brings the barometer down again until the fly is again arrested by the arm.

These small successive movements are, of course, followed by the pencil, and thus a straight line is produced if the barometer is stationary, and one varying right or left, according as the column rises or falls.

On the other side of the barometer are two other movements, one R driving the paper-covered cylinder, the other R′ driving a small tapping apparatus to overcome any capillarity in the barometer.

If desired, an arm of any required length can be attached to the pulley P, and it will then act as a wheel barometer.

The meeting was then adjourned.

DONATIONS RECEIVED FROM APRIL 1ST TO JUNE 30TH, 1875.

Presented by Societies, Institutions, &c.

Brussels	Observatoire Royal	Annales, March to May.
Calcutta	St. Xavier's College Observatory	Meteorological Register from July to December, 1874. Rev E. Francotti, S.J., Director.
Christiania	Norske Meteorologiske Institut	Norsk Meteorologisk Aarbog for 1873. By Dr. H. Mohn, Director.
Copenhagen	Danske Meteorologiske Institut	Bulletin Météoroiogique du Nord, March 1 to May 31. By Captain N. Hoffmeyer, Director.
Cracow	K. K. Sternwarte	Meteorologische Beobachtungen, February to May. By Dr. F. Karlinski, Director.
Dorpat	Kaiserliche Universität	Meteorologische Beobachtungen im Jahre 1872 and 1873. Band 2. Heft 2 and 3. By Dr. C. Hornstein, Director
Edinburgh	Royal Observatory	Report addressed to the Board of Visitors of the Royal Observatory, Edinburgh, at their Visitation thereof, on Tuesday, May 18th.
Fiume	I. R. Accademia di Marina	Meteorological Observations, September 1874; January to March 1875.
Hamburg	Deutsche Seewarte	Siebenter Jahres-Bericht der Deutschen Seewarte für das Jahr 1874. By W. H. Von Freeden, Director.
Klagenfurt	K. K. Sternwarte	Meteorologische Beobachtungen, January.
London	General Register Office	Weekly Return of Births and Deaths, Nos. 12-17, 19-24.
	" "	Annual Summary of Births, Deaths, and Causes of Death in London and other large Cities, 1874. By the Registrar-General.
	Meteorological Office	Daily Weather Reports and Charts.
	" "	Instructions for taking Sea Temperature, &c., at Lightships and other stations.
	" "	Report of the Permanent Committee of the first International Meteorological Congress at Vienna for the year 1874. Meetings held at Vienna and Utrecht, 1873 and 1874.
	" "	Hourly Readings from the self-recording Instruments, at the Seven Observatories in connection with the Meteorological Office, October to December 1874. By the Meteorological Committee.
	Royal Astronomical Society	Monthly Notices, Vols. xxxii-xxxiv.
	Royal Institution	Proceedings, No. 62.
	Royal Society	Proceedings, Nos. 160 and 161.
	Society of Arts	Journal, No. 1169.
Manchester	Literary and Philosophical Society	Proceedings, Vol. xiv. No. 10.
Melbourne	Observatory	Monthly Record of Results of Observations in Meteorology, Terrestrial Magnetism, &c., September and October, 1874. By R. Ellery, F.R.S., Government Astronomer.

....	R. Osservatorio Astronomico di Brera	Sulle Variazioni Periodiche e Non Periodiche del la Temperatura nel Clima di Milano. Memoria di Giovanni Celoria.
	" "	Sull' Eclissi Solare Totale del 3 Giugno 1239. Memoria di Giovanni Celoria.
ıa	R. Osservatorio	Sulle Burrasche del 19e del 25 Febbraio 1875. Lettere del Dott. F. Mina Palumbo e del Prof. D. Ragona.
ılieri	Osservatorio del R. Collegio Carlo Alberto....	Bullettino Meteorologico, Vol. ii., No. 7; and Vol. ix., No. 7. By Padre F. Denza, Director.
....	Observatoire de Montsouris	Bulletin Mensuel, Nos. 39-41. By M. Marié Davy, Director.
	Observatoire National ..	Bulletin International. By M. U. J. Le Verrier, Director.
	Société Météorologique de France	Nouvelles Météorologiques, June to October 1871; April and May, 1875.
....	Osservatorio del Collegio Romano	Bullettino Meteorologico, March and April. By Padre A. Secchi, Director.
'ernando	Observatorio de Marina..	Anales Suplemento Seccion 2. Conferencia sobre Meteorologia Maritima celebrada en Londres en 1874.
y	Government Observatory	Meteorological Observations, September to December 1874. By H. C. Russell, B.A., F.R.A.S., Government Astronomer.
to	Education Office	Journal of Education, March to May. By Rev. E. Ryerson, D.D., Superintendent.
lge. Wells	Association for promoting the interests of the Town of Tunbridge Wells....	Pelton's Illustrated Guide to Tunbridge Wells and the neighbouring Seats, Towns and Villages. By J. R. Thomson, M.A.
a........	Observatoire de l'Université	Bulletin Météorologique Mensuel, Vol. vi., No. 10, October 1874. By H. H. Hildebrandsson, Director.
a	Kaiserliche Akademie der Wissenschaften	Ueber die Wasserabnahme in den Quellen, Flüssen und Strömen bei gleichzeitiger Steigerung der Hochwasser in den Culturländern. Von Gustav Wex.
	" "	Bericht der zur Begutachtung der Abhandlung des Herrn Hofrathes G. Wex über die Wasserabnahme in den Quellen und Strömen eingesetzten Commission.
	K. K. Centralanstalt für Meteorologie und Erdmagnetismus	Beobachtungen, February to May.
	" "	Jahrbuch, Band x., 1873. By Dr. C. Jelinek, Director.
	Oesterreichische Gesellschaft für Meteorologie	Zeitschrift, Band x., Nos. 7-12.
ington ..	Chief Signal Office	Monthly Weather Review, May. By Brigadier-General A. J. Myer, Chief Signal Officer.
ord	Natural History Society	Laws and List of Members, February.

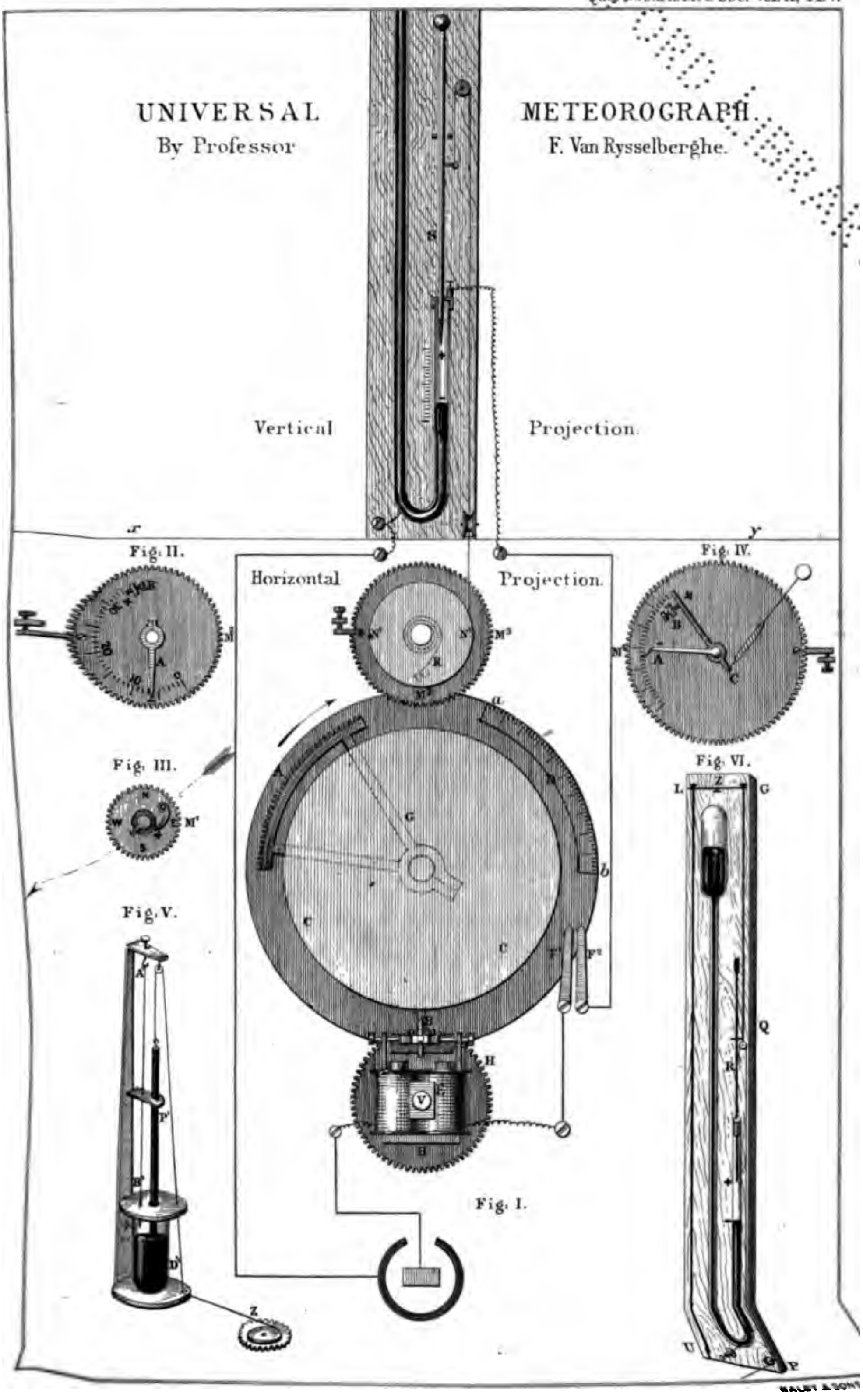
Presented by Individuals.

idge, E. G.	Spring Frosts in the United Kingdom.
"	Maximum Temperature in May. Letter to the "Torquay Directory."
ıam, C., M.D.	Remarks on Surface Temperature and on the effect of Shelter.
, ...	Meteorological Notes for 1874.

Cleft, H.	The Weather at Harbour Grace, Newfoundland, January to May.
Conway, Sergt. J., R.E.	Abstract of Meteorological Observations taken at the Royal Engineer Observatory, Chatham, during the year 187[illegible].
"	Monthly Means of Meteorological Observations and Monthly Rainfall at Chatham.
"	Chart showing the number of days the wind blows in Chatham from each point of the Compass.
Curtis, John	Meteorological Memoranda for Manchester for the week ending April 29th.
"	Rain for the first four months in 1875.
Delany, John	Newfoundland Almanac, 1875.
"	The Proposed Railway across Newfoundland. A Lecture, delivered in the New Temperance Hall, by Father [illegible] Morris, February 9th.
Dunlop, W. H.	Results of Meteorological Observations made at Annanhill, Kilmarnock, Ayr, March and April.
Higgs, Rev. W., LL.D.	'The Telegraphic Journal and Electrical Review.' Nos. 2, 3, 8, 18, 52-57.
Hopkinson, John, F.L.S.	Proceedings at the Meetings of the Watford Natural History Society, May 13 and June 10.
Hoskins, S. E., M.D., F.R.S.	Meteorological Observations taken at Guernsey, March to May.
Le Couteur, Col. J., F.R.S.	On the rise, progress, and present state of Agriculture in Jersey, a lecture written at the desire of the Working Men's Association of Jersey, and read before that Society on the 16th of December, 1850. By Colonel Le Couteur, F.R.S., with notes added.
" "	On the varieties, properties and classification of wheat.
Mann, R. J., M.D., F.R.A.S.	Journal of the Society of Arts, No. 1171.
Miller, S. H., F.R.A.S.	The Fenland Meteorological Circular and Weather Report, April to June.
Murray, A. E.	Summary of a Paper on 'The Atmosphere,' read before the Hastings Historical and Philosophical Society, March 16.
Quetelet, E.	Note sur la Température de l'hiver de 1874-1875, par M. Ern. Quetelet.
Russell, H. C., B.A., F.R.A.S.	Table to facilitate finding the Humidity of the Air.
" "	Description of an Electrical Barograph.
Scott, R. H., M.A., F.R.S.	The Winds of Northern India, in relation to the Temperature and Vapour constituents of the Atmosphere. By H. F. Blanford, F.G.S.
Silver, S. W.	'The Colonies,' Nos. 183, 184, 186-189.
Symons, G. J.	Symons's Monthly Meteorological Magazine, April to June.
"	Symons's British Rainfall, 1874.
"	Annuaire de la Société Météorologique de France. Tableaux Météorologiques, 1868, Feuilles 11-14; 1869, 5-10; 1870, 1-6; 1872, 1-4; 1874, 1-4.
"	Do. Bulletin des Séances, 1870, Feuilles 9-21; 1875, 1-7.
"	Nouvelles Météorologiques, 1871, Feuilles 5-10; 1872, 6-11.
"	Meteorological Journal of the late Miss Caroline Molesworth, of Cobham, November 1823 to December 1824. (MS.)
The Editor	'The Academy,' Nos. 157-164.
"	'Nature,' Nos. 283-295.
"	'Public Health,' Nos. 17 and 24.
Turner, G., L.R.C.P.	Report of the Medical Officer of Health to the Urban Sanitary Authority, with monthly, quarterly, and yearly tables of Death for 1874.
Turtle, Lancelot	The Weather at Aghalee, Lurgan, February to May.
Wheatstone, Sir C., F.R.S.	On a necessary correction to the observed height of the Barometer depending upon the Force of the Wind. By Captain H. James, R.E., F.R.S.
" "	Account of the Construction of a Standard Barometer, and Description of the Apparatus and Process employed in the Verification of Barometers at the Kew Observatory. By J. Welsh.
" "	Recherches sur les Variations qui ont lieu à certaines périods de la journée dans la température des couches inférieurs de l'Atmosphère, par M. le Prof. Marcet.

UNIVERSAL METEOROGRAPH.

By Professor F. Van Rysselberghe.



QUARTERLY JOURNAL

OF

THE METEOROLOGICAL SOCIETY.

VOL. II. No. 16.

XXXVIII. *Remarks on some practical points connected with the construction of Lightning Conductors.* By ROBERT JAMES MANN, M.D., F.R.A.S., President.

[Received April 21st. Read May 19th, 1875.]

THERE are certain principles, bearing practically upon the efficient protection of buildings from injury by lightning, which are well ascertained, and which are now looked upon as established facts in electrical science. Thus, for instance, it is well-known that the primary aim of the architect or engineer who attaches a lightning conductor to any building, is to furnish a path for the electrical discharge that shall afford the least possible resistance to its passage, or, in another form of expression, a ready way for the escape of the pent-up force. This end is gained—first, by employing a metal that is in itself a good conductor of electrical action: and secondly, by taking care that the dimension of the metallic conductor, whether it have the form of strip, rod, or rope, is ample for the work that it has to do;—that there is large and free communication between it and the earth, which is the great electrical reservoir of Nature; and that there is no break of metallic continuity, —no obstruction to the free and unimpeded movement of the discharge any where.

When the question of the character and size of the lightning-rod, which may be expected to fulfil these conditions satisfactorily, was examined by the French electricians in the year 1823, and still more recently in 1854, it was held that a quadrangular iron bar, three-quarters of an inch in diameter, was sufficient in conducting power for all purposes. Since that time ropes of metallic wire have pretty well superseded the employment of solid bars, on account of the greater facility with which they can be applied to objects of irregular form, and on account of the readiness with which they can be constructed, in unbroken continuity, to any length. Copper is, also, very

generally used in preference to iron, because of its superior transmitting power, and of its greater immunity from corrosive oxidation when exposed in moist air. In reality, however, the selection of iron or copper is not of material importance, if the surface, in the case where iron is employed, be protected from oxidation by a coating of zinc, and if the size of the rope or bar be sufficiently great to compensate for the inferiority of its transmitting power. That is to say, a large rope or bar of iron conducts quite as freely and well as a small rope or bar of copper. Copper is about five times as good a conductor of electrical force as iron; an iron rope or rod, to perform the same work, should, therefore, have at least a sectional area five times as large as a copper rod or rope. It must, however, always be borne in mind that the resistance of a metal conductor increases with its length, and that, therefore, for the protection of lofty buildings, larger ropes or rods are required than need be employed for lower structures. The facility of electrical transmission in any conductor is practically in the exact ratio of the coefficient of the conductibility of the metal, multiplied by the section of the rod, and divided by its length.

The French electricians of the present day adopt copper wire ropes of from four-tenths to eight-tenths of an inch for each 82 feet of height. Mons. R. Francisque Michel, who is at the present time the scientific adviser of the French Governmental Department of Works in such matters, seems to consider a rope of galvanised iron wire, eight-tenths of an inch in diameter, to be ample for most purposes. Mr. Faulkner, of Manchester, has recently used in the protection of St. Paul's Cathedral, which, even within the last three years, was found to be in a very faulty state in regard to its safety from lightning, a copper wire rope, half an inch in diameter, which is made of eight strands of one-tenth of an inch copper wire, coiled round a core of seven smaller copper wires of about one half that diameter. This copper rope weighs six ounces and three-quarters to the foot. Eight of these ropes, in the case of St. Paul's, have been brought down from the golden cross, which surmounts the dome, to the ground: the element of great height in this instance has, therefore, been amply provided for.

Mr. Faulkner frequently uses, for the connection of large iron pillars and other metallic masses in large factories, and for earth-contacts with the pillars, large bands of solid copper of No. 11 Birmingham iron wire gauge, and four inches broad, and which weigh one pound thirteen ounces to the foot. Messrs. Sanderson and Proctor, of Huddersfield, manufacture a very convenient kind of copper tape for lightning conductors, which is three quarters of an inch wide, and an eighth of an inch thick, which has even more flexibility than wire rope, and which can be made in continuous stretches of great length with equal facility. Strips have the advantage over rope in one particular. They are free from the strain which is prone to be set up in the molecular condition of rope under the operation of twisting. Mr. Gray, of Limehouse, refers to some instances in which copper rope has seemed to have been rendered incompetent for its conducting work by the influence of the strain.

There is one condition in the arrangement of a lightning conductor which is even more important than the conducting capacity of the rope or rod; namely, the freedom of its electrical communication with the earth. In the case of a rain pipe, it would be of no practical utility to put up a pipe of four inches diameter, if the hole below for the escape of the water were contracted to an aperture of a quarter of an inch. Yet the arrangements that are very commonly made, in what is termed protecting a house from lightning, are even infinitely worse than this. It is quite a common occurrence to find lightning conductors with ten thousand times less outflow for the electrical force beneath, than there is passage for it through the main channel of the rod. The result in such cases is that the entire conductor is reduced in vertical effectiveness to the proportions of its weakest or smallest part; that is, it is made inefficacious entirely for the work that it is expected to do. This practical evil is, also, increased in an enormous degree from the unfortunate fact that lightning conductors tend continually to get less and less efficacious in their earth-contacts from natural causes. The metallic surfaces below the ground become covered over with thick crusts of oxidation, and are eaten away from combined chemical and electrolytic agency; and as this occurs, they afford no visible or palpable indication of the growing defect, until grave mischief happens from some chance lightning stroke. Faulty earth-contacts are unquestionably the most frequent cause of failure of lightning rods to perform the office for which they are designed.

MM. Pouillet and Ed. Becquerel have entered upon some very laborious and exact experiments to determine the relative capacities of pure water and metallic copper to conduct an electrical current or discharge; and they have arrived at the conclusion that metallic copper conducts 6,754 million times more readily than pure water. In accordance with this deduction, a copper rod, if it were made for electrical purposes to terminate in an earth-contact of pure water, would need to have a surface exposed to the water 6,754 million times larger than the sectional area of the rod. This theoretical conclusion is, however, materially affected by the fact that it is not pure water that is encountered in the pores of the moist ground. It is water that contains various saline principles and other matters in solution; and these dissolved matters increase its power of electrical transmission enormously. From this cause, and from some other correlative influences, it has been found that if 1,200 square yards of actual contact with moist earth is provided for a copper rope or rod eight-tenths of an inch across, that proves to be an ample allowance for all purposes. But even that, it will be observed, is somewhat of a formidable task. It means an actual surface of contact 34 yards across in both directions. The most ready and immediate means by which this large earth-contact can be made in towns is by effecting an intimate metallic connection between the lightning rope and the metallic pipes of the water supply. Where this cannot be done, other expedients have to be adopted.

The French electricians have recently contrived a stout harrow of galvanised iron with down-hanging teeth for the accomplishment of their earth-contacts;

and they pack this harrow away into some moist part of the ground, surrounding it carefully with a mass of broken coke. M. Callaud, a French electrical engineer of some distinction, has a refinement even upon this. He anchors his rope in an underground basket of netted wire, by means of a kind of coarse iron grapnel, with four up-turned and four down-turned teeth; and he packs round the grapnel, within the wire basket, with broken coke. The coke is a very admirable agent for establishing the electrical communication between the earth and the rope or rod, on account of its great porosity. It is immediately saturated with moisture, when it is placed in moist earth. M. Callaud has ascertained that two bushels and eight-tenths of porous coke afford the 1,200 square yards of contact-surface that are required. The alternative, when neither the harrow nor the grapnel are employed, is to make a five-inch bore down twenty feet into the moist earth; to insert into this bore the lower end of the conductor, whether rod or rope; and then to ram it well round with broken coke, until the bore is filled. Horizontal trenches opened out in the actually moist ground, and with the end of the conductor distributed into them, with a surrounding packing of coke, answer very much the same purpose. Messrs. Gray and Son, of Limehouse, employ for their earth-contacts two divergent trenches of this character, each about sixteen feet long.

My friend, Dr. Williams, who is a keen observer of most matters that concern atmospheric meteorology, tells me that in the neighbourhood of Gais, near to St. Gall and Appenzel, the beginning of the Highlands immediately to the south-west of Lake Constance, there are from two to eight lightning conductors to every house, and there are, nevertheless, conflagrations from the discharge of lightning upon the houses every season. The lightning conductors are, obviously, inefficient for the work which they are intended to perform, and Dr. Williams ascribes this to the insufficiency of the earth-contacts. The soil consists principally of porous limestones and conglomerates, which dry very rapidly; and in all probability the lightning rods are just placed in contact with the dry rock, without any attempt to compensate the dryness by special contrivances for enlarging the surface of communication. The rods are, consequently, very much in the condition of the well-known case of the lighthouse at Genoa, in which the lightning conductor was terminated below in a stone rain-water cistern especially constructed to keep out the infiltration of the sea, or of my own instance of the lightning rod of a church tower which was packed away at the bottom in the inside of a glass bottle.

Perhaps the most important advance that has been made by electrical science in recent days, in regard to the establishment of efficient earth-contacts for lightning rods, is the assertion of the principle that the efficiency of the earth-contacts must be in all cases tested by actual experimental proof. The circumstances upon which the free transmission of the electrical force depend are so complex and varied, that it is only when a direct investigation of the freedom of the transmission has been made in any individual case, that all the requirements of exact science can be held to have been

efficiently fulfilled; and it fortunately happens that there is an instrument in the hands of scientific men, which enables this crucial test of efficiency to be very readily applied. This instrument is the galvanometer. The needle of a galvanometer is deflected by an electrical current passing through the coil of the wire to an extent which indicates the readiness with which the current is transmitted through the coil. Now, if both terminals of the wire of a galvanometer are placed in direct communication with each other, through short circuit, with a Leclanché Battery of a couple of cells coupled up into the circuit, and the degree of the deflection of the magnetic needle under this circumstance of free and entirely open transmission, be noted, this at once becomes a standard with which any less free transmission of the current can be compared. If, then, all other circumstances being the same, the short circuit is broken, and one terminal of the wire of the galvanometer is placed in communication with a gas pipe unquestionably in unimpeded communication with the earth, and the other terminal is placed in electrical communication with the rope or rod of a lightning conductor, the circuit in such case has to be completed *through the earth-contact* of the conductor, instead of through the shorter route, and if there is any increase of resistance or impediment there, this at once becomes manifest in the deflection of the needle of the galvanometer being to that extent less than it was in the previous arrangement with that circuit. If the earth-contact of the lightning rod is sufficiently open and perfect, the deflection of the galvanometer is very nearly the same in both instances. In the arrangements carried out within the last two years for the protection of St. Paul's by Mr. Faulkner, every large mass of metal in the construction of the building was brought in succession into metallic connection with the main track of the lightning conductor, and was never left, in any instance, until the indications of the galvanometer manifested that the earth-contact from it was virtually open and free, at least to within one or two degrees of the deflection of the needle. The copper ropes terminate with carefully rivetted attachments in copper plates, which are pegged into the moist earth of the sewers beneath the streets surrounding the Cathedral.

Mr. Spiller has drawn attention to the very common occurrence of the rapid destruction of a copper lightning conductor attached to a chimney-stack, through the influence of the sulphurous vapours emitted from the burning coal; and has suggested that nickel plating may afford an efficient remedy to the evil, as he finds there is not the slightest action upon a nickel-plated surface, after it has been buried for weeks in powdered sulphur. It unfortunately happens, however, that the conducting power of nickel is very low, in comparison with that of copper—lower even than that of platinum. If silver be taken as the standard of conductibility, and be estimated as 100, then the relative value of the conducting power of copper, platinum and nickel, is:—copper, 91·4; platinum, 8·1; and nickel, 7·7. The relative resistance of the same metals to the transmission of the electric force, if silver be taken as a standard at 100, are respectively:—copper, 109·8; platinum, 1248·4; nickel, 1428. Protection from such fumes would

probably be quite efficiently provided if the copper conductor were carefully enclosed within a leaden tube soldered over the conductor at its extremities, wherever damage from this cause has to be apprehended. This plan is adopted by the French electricians very satisfactorily, in establishing earth-contacts, wherever there are ammoniacal vapours present in the ground. Messrs. Sanderson and Proctor state that they are introducing ebonite tubes for the same purpose.

Whenever different lengths of a lightning conductor have to be joined, this requires to be done with the utmost nicety and care. If there is any break in the metallic continuity, it materially increases the resistance, and impairs the efficiency of the conductor. In the case of metallic ropes, the wires are generally untwisted and spliced together, where the contact has to be made, and the joint is afterwards dipped into melted solder. Mr. Faulkner effects the union of his broad copper straps by covering the joint with an overlapping plate, and screwing the whole firmly together by screws passed through the thicknesses of the overlapping parts. M. Francisque Michel, in renovating and perfecting the attachment of many of the impaired lightning conductors furnished to the public monuments in Paris, has adopted the ingenious expedient of screwing on washers of soft lead very firmly between the contiguous surfaces of the interrupted joints, and then covering the whole joint up with a coating of melted solder.

The instructions of the French Académie des Sciences, issued by Pouillet in 1854, directed that the lightning conductor should be terminated above by a solid rod, if of iron, two inches and a quarter in diameter, carried up from fifteen to thirty feet above the highest point of the building to be protected. The reason for this increase in the dimension of the rod at its upper extremity is found in the well-known fact, that the largest disruptive effort is exerted, when an electrical discharge occurs through a line of conducting metal, at the two opposite extremities of the conductor. On this account, both the earth-contact and the upper termination must be strengthened to meet this strain. When points are employed at the upper termination of a lightning conductor, however, the need for this increased size is, to a considerable extent, obviated, in consequence of the point setting up a continuous stream of low tension. The real value of the point, indeed, is due to this peculiarity. A well-arranged lightning conductor, furnished with efficient terminal points, discharges or saturates a thunder-cloud at a great distance silently, and almost certainly prevents any actual disruptive discharge, or flash, of the lightning. The immediate consequence of this is, that the electrical discharge passing through the conductor never reaches the condition of high tension. It flows off in a gentle stream, which never at any time has expansive energy enough to burst out from the channel provided for its conveyance, or to produce, by induction, return shocks, or other sudden and violent effects of an inductive character. The blunt conductor, struck by a true flash of lightning, on the other hand, although it may convey the discharge to the ground, is, at the instant of the passage, filled with a force of such high tension and of such energetic expansion, that it is

ready to leap forth from the conductor to any body conveniently near, upon the slightest excuse or provocation. A living person may embrace a lightning rod discharging a thunder-cloud through a point, without knowing any thing about the matter; but he could not do the same thing with a blunt lightning conductor discharging a thunder-cloud, without incurring the greatest personal danger. There are various simple experiments by which this particular power of the point may be familiarly illustrated; but a very remarkable and telling instance of this power has just been communicated to me by Mr. F. G. Smith, in allusion to some remarks I had printed on the subject. Mr. Smith was engaged in the August of 1865 in ascending the Linguard Mountain from Pontresina in the Engadine with three companions, and was caught during the ascent in bad weather. He nevertheless reached the summit, which is a sharp, narrow ridge, shaped like the back of a horse, and 11,000 feet above the sea. At one end of the ridge there is a flag-staff tipped with an iron point, and at the opposite end an observation disc of the same height, covered with an iron hood. When he stood upon this ridge there was nothing visible around but grey mist and falling snow, and almost immediately the otherwise death-like stillness of the gloomy spot was broken by a strange intermitting noise, resembling the rattling of hailstones against the panes of a window. A careful investigation of the cause of this noise soon made it apparent that it proceeded from the flag-staff, and that it was sometimes at the top, sometimes at the base, then quivering all through from top to bottom, now loud, now soft, but never ceasing for a moment. The rattling was in reality due to the passage of a continuous stream of electrical discharge from the cloud, in which the summit of the mountain was wrappod, down the flag-staff. After a little time the entire party held up the pointed ends of their alpen-stocks into the air, and immediately the same rattling noise appeared in each, and the electrical discharge was felt by each individual passing through them and causing a throbbing in the temples and a tingling in the finger-ends. The noise was still going on vigorously when Mr. Smith left the summit, after a sojourn upon it of three-quarters of an hour. The broad iron hood and flat observation plate in the mean time were perfectly untouched by the discharge.

Some distinguished electricians of a past age maintained that it was of no importance whatever to place a sharp point upon the top of a lightning rod, because even a metallic ball some inches across is virtually a point to a thunder-cloud, on account of its being so very much smaller than the cloud. This, however, is certainly a mistake. Mons. Gavarret, Professor of Natural Philosophy to the Faculty of Medicine at Paris, in some very beautiful experiments, has shown that the tension or striking force, which can be produced in the prime conductor of an electrical machine, is progressively diminished as longer and sharper points are brought into operation in the neighbourhood, to draw off the charge. The points are placed a little distance away from the conductor, and are attached to an earth wire. If a slender and sharp point exerts more exhausting influences over the charged conductor than a coarse and blunt one, it is perfectly clear that a point

must exert a stronger influence over a charged cloud than an unsharpened rod or a ball.

Platinum has been very generally recommended for the construction of the points of lightning rods, on account of its property of remaining sharp and uncorroded when left freely exposed to the moist air, and even when frequently transmitting streams of electrical discharge. Platinum is one of the most difficult metals to melt, and is comparatively indifferent to the chemical attractions of oxygen. But, on the other hand, it is, unfortunately, not a good conductor of electricity. It has twelve times less conducting power than silver, and eleven times less conducting power than copper. The employment of platinum as the upper terminal of a lightning conductor consequently increases the resistance of the rod, on the ground of constituent material, at the same time that it reduces the resistance by figure when in the pointed form. Mons. Francisque Michel, the Superintendent of the Electrical Department of the Public Works at Paris, has, consequently, superseded platinum by an alloy of copper and silver, which contains 165 parts of copper to 885 parts of silver. This form of point keeps its sharpness very well, and conducts quite as freely as the copper conductor. The points are about two inches long, and are shaped off to a cone, having an angle of from seven to ten degrees. They are so contrived that they can be screwed firmly home into a socket provided for them at the end of the copper rod. Plain copper points, however, answer all purposes very well if they are examined from time to time, and kept fairly sharp and clean, and especially when several points are used in the place of one pointed terminal. The multiple point is gradually making its way, as it thoroughly deserves to do, into general use, and into the confidence of scientific men. Various forms of it have been devised; but all that is really practically needed is, that the conductor shall be branched out above, and forked out in all directions, so that there shall be points every where projecting beyond the cone of protection recognised by the electrician, which, to make the protection entirely reliable, should have a perpendicular height at the apex of something like half the breadth of the building. Wherever the building extends beyond, or even approaches near to the limits of this conical surface, there should be a point pushed out a little further still, and at the same time connected metallically with the general stem of the conductor. M. Melsens, the Belgian electrician, who has recently perfected the protection of the Hotel de Ville in Brussels, has left that large building literally bristling over with points. There are as many as 228 copper points and 36 iron points comprised within this system of defence, and it is quite impossible to conceive any more effectual arrangement of the upper terminals of a lightning conductor.

M. Melsens in his practice adopts the generally accepted plan of connecting all large metallic masses contained within the building with the main stretch of the conductor; but he does this after a fashion somewhat peculiar to himself. He makes the connection by means of *closed circuits*, that is, he attaches the metallic mass to the lightning rod by two distinct metallic strands, carried to two distinct points of the rod. He considers that in

this way the protection against inductive disturbance and return-shocks is more absolute and complete; and he, no doubt, has in support of his view the authority of Professor Zenger, of Prague, who has devised some experiments which he conceives to demonstrate that the best of all protectors is a circular segment of metal carried transversely overhead across the area containing structures that have to be defended. M. Francisque Michel, and most of our own electrical engineers, in the mean time adhere to the practice of connecting all large masses of metal in a building with the lightning conductor by a single metallic strand.

M. Callaud, a French electrician who has recently printed an interesting book on 'The Lightning Conductor,' objects strongly to this practice of connecting masses of metal entering into the construction of the building with the lightning rod, and also insists upon the insulation of the rod itself from the masonry of the building by non-conducting supports, such as are used with telegraph wires,—an expedient that has been for some time almost universally abandoned, so far as the lightning rod is concerned. M. Callaud's reason for this course is perfectly intelligible. He contends that metallic masses employed in the ordinary work of construction are frequently placed where living people have occasional access to them, as in the instance of an iron balcony projecting in front of a French window; and that where this is the case, the danger of such people is materially increased if the metal work or balcony is connected with the conductor, because then the living body is apt to form a stepping-stone of approach, if the lightning passes that way to the system of the conductor. M. Callaud argues, and so far argues correctly, that the lightning rod is very much more likely to be struck than the masonry or woodwork of a building, and that any metallic appendage, such as an iron balcony, stands in the category of the conductor when it is connected with it, and in that of the masonry when it is not so connected. Thus, a living person placed near to a balcony that is connected with the rod is, in the same degree, more likely to be struck by a discharge than a person placed near a balcony that is without such metallic connection. The practical inference is, that metallic masses in a building should always be metallically coupled up with the lightning conductor when they are so situated that they are not liable to have living persons near to them during the prevalence of a storm, and that they should be left unattached to the conductor when they are so situated as to be of ready access to persons inhabiting the buildings. It should, however, be also clearly understood, that this connection or non-connection of incidental masses of metal is of no practical moment whatever when a building comprising them has a really efficient lightning conductor, with ample earth-contacts and an abundant supply of well-arranged points dominating its entire mass. It is only when a conductor is in so imperfect a state, or is so badly planned, that subordinate masses of metal can act as recipients and feeders of the discharge through the earth-contacts, that the question of connection of such masses with the conductor becomes one of practical moment. A properly planned lightning conductor should cover and afford absolute protection to

all that a house comprises and contains, and should render a lightning stroke to any subordinate part of the structure a virtual impossibility. M. Callaud seems to insist upon the support of the lightning rod by insulating attachments, principally because it is a part of his general principle of avoiding electrical connection with the structures of the building. My own impression upon this point, however, is that it is certainly a work of superfluity to take any trouble about such insulation. In a considerable experience with lightning conductors, in which insulation has never been adopted, I have never known any case of injury, even of the most trifling kind, from this cause. Messrs. Gray and Son have met with one curious and notable case, in which a copper rope, which had been grasped by insulating conductors, had been broken and disintegrated wherever the rope had been connected with an insulator. This result, however, was most probably due to some mechanical cause, affecting the molecular condition of the strained wires at those points.

The insulation of the rod certainly promotes, rather than prevents, the production of the incidental sympathetic discharges, which are known as "return shocks." These "return shocks" are entirely due to the operation of induction. When a lightning rod is placed in a state of high electrical tension, in consequence of being under the influence of a neighbouring storm-cloud, it immediately calls up inductively a similar state of electrical disturbance and tension in material masses that are near to it, but separated from it by a non-conducting space or gap. When the storm-cloud is suddenly discharged under such circumstances, whether through the conductor, or by some other route, the tension in the conductor is instantaneously relieved, and at the same moment all secondary tensions produced by it are also terminated in the same instantaneous fashion. The secondary tensions, under these circumstances, are very apt to leap to the earth through, more or less, imperfectly conducting routes of their own improvising, and to produce some mechanical disruption in doing so. The proper and effective cure for such incidental disturbances is, the employment of such a system of pointed terminals as renders the production of any state of high electrical tension in the conductor impracticable.

The "tall-boys," or metallic chimney-pots, so commonly employed in towns to increase the force of the chimney draughts, may be imminent causes of danger in houses not furnished with lightning rods, because the column of heated air ascending to them from a burning fire through the chimney is a conducting route of considerably diminished resistance as far as the fire-grate; but it is a conducting route that generally terminates there, and that, therefore, is very apt to lead a lightning discharge to the earth through the intermediate steps of living persons inhabiting the room. The "tall boy," on the other hand, forms a very ready base for the support of an efficient point, if it has the conducting route from it to the earth completed by a competent rod and earth-contact. Messrs. Gray and Son, of Limehouse, speak of one case in which a large and lofty chimney-shaft of brickwork was materially damaged by a lightning stroke, although the chimney had an apparently good lightning rod fixed at one side of the shaft. The

point of the chimney at which the electric discharge came into communication with the ascending column of heated air was, in this instance, four feet and a half nearer to the discharging cloud than to the lightning rod. The discharge in this case found the column of heated air, the surrounding brick-work, and the furnace beneath, which was some distance away from the bottom of the chimney-shaft, an easier path of escape than the lightning rod. The Messrs. Gray advocate the surrounding of the top of tall chimneys with a complete edging of copper bands, to obviate the possibility of accidents of this character. A well-arranged multiple point reared well above the chimney, and protected from the corrosive action of sulphurous fumes, would, no doubt, answer quite as well. In the case of large and costly structures, both plans may, nevertheless, be advantageously combined.

Rain-water pipes, which are indispensable contrivances in all houses, may be easily turned to account as lightning conductors; but they must then be made metallically continuous from some prominent point or points above to an efficient earth-contact. All joints in the pipe must be absolutely neutralised by well-attached strips of metal carried over them from length to length; and over and above this, care must be taken that they are not within striking distance of any superior line of conduction at lower parts of the house, as, for instance, gas pipes connected with the main service. If they are within such striking distance, there will always be a probability that a discharge may leap across from them to the secondary line of conduction, and do mischief of some kind by the way. The Messrs. Gray have had one case within their experience in which a discharge of lightning leapt in this way from a rain-water pipe to an iron gas-pipe, and made a breach of continuity in the latter, and set light to the gas.

It is very much to be desired that protection from lightning should enter as essentially into the designs of architects who plan houses as protection from rain. Sir William Snow Harris holds the honourable position of having established that doctrine in regard to ships, and of having perfected a plan for their protection from lightning that leaves scarcely any thing to be desired. Damage from lightning to vessels of the Royal Navy is now virtually an occurrence that is never heard of. The day, in all probability, will come when the same remark will be able to be made in reference to houses, at least where these are gathered closely together into towns. It is, indeed, quite possible that towns may be made to bristle with pointed lightning conductors, until no charged thunder-cloud could retain a high-tension charge when within striking distance, so that the flash of disruptive lightning would be virtually banished from the urban precincts. This is really what has pretty well happened in the case of the Capital of the Colony of Natal, where lightning rods of good construction have been rapidly multiplying in recent years. Damage from lightning is now scarcely ever heard of within the town, although the lightning is seen flashing immediately around with the most vivid intensity every second or third day through the six months of the hot and wet season.

Until lightning conductors are supplied with the rain-water pipes to houses

as part of the architect's design, all intelligent men should know just enough of the leading principles of electrical science to be able to make such arrangements for themselves, for the efficient protection of their houses from lightning, as have been briefly glanced at in this paper. The indispensable conditions that have to be secured in accomplishing this are simply:—1. The lightning conductor must be made of good conducting material metallically continuous from summit to base, and of a dimension that is sufficient for the ready and free conveyance of the largest discharge that can possibly have to pass through it. 2. It must have ample earth-contacts, and these contacts must be examined frequently, to prove that they are not getting gradually impaired through the operation of chemical and electrical erosion. 3. It must terminate above in well-formed and well-arranged points, which are fixed and distributed with some definite regard to the size, form and plan of the building. 4. There must be no part of the building, whether it be of metal or of less readily conducting material, which comes near to the limiting surface of a conical space, having the highest point of the conductor for its apex, and having a base twice as wide as the lightning conductor is high, without having a point projected out some little distance beyond, and made part of the general conducting line of the lightning rod by a communication with it beneath. 5. There must be no mass of conducting metal, and above all things, no gas-pipe connected with the main, within striking distance of the lightning rod, lest at any time either the points or the earth-contacts shall have been so far deranged or impaired as to leave it possible for discharges of high tension, instead of continuous streams of low tension, to pass through the rod, and to be diverted from it into such undesigned routes of escape.

DISCUSSION.

Mr. Pastorelli, in alluding to the importance of the paper, remarked that he believed the public were very ill-informed on the subject of lightning and conductors. With respect to the forest of metal chimney-pots in towns, they enjoy comparative immunity; this he attributed to the proximity of church steeples and other high buildings provided with lightning conductors, for at their points the electric fluid would have a great tension and tend to flow towards the storm-cloud, forming as it were a channel for the passage of the electric fluid from the cloud to their points. If zinc pots were placed on an isolated house in a large open space, they should be connected with a lightning conductor, otherwise they would prove most dangerous.

Mr. Strachan said it appeared to him that the rules for constructing lightning conductors were framed very much upon guess-work, and he supposed this must be so; but there was a tendency to idealise too much. The practice of the engineers who did this kind of work was not uniform; much of it depended upon individual opinion, often crotchety, and seldom admitting any proof of efficacy. Was it demonstrated that the resistance of a conductor increased with its length? Was there any certainty of the utility of a *couronne* of points? Beyond the simple facts that the conductor should be pointed, continuous, and led into moist earth or water, very little seemed known for certain as to the best construction of lightning rods. There was a tendency to make them complicated, notwithstanding that the lightning rod in its simplest form as hitherto used had been evidently useful, especially for ships. It is very seldom now-a-day that ships were struck by lightning, and we infer that this is because their masts are iron or fitted with conductors. The last instance known to him was that of H.M.S.

"Shannon," in or about 1857, which lost topmast, although it was fitted with Harris's conductor, but suffered no other injury, from a terrific lightning flash.

Mr. T. G. SMITH, in reply to the Chairman, who asked whether he could add any thing to the brief account that had been given by Dr. Mann of his notable experiences on the Linguard, said that the occurrence which had been alluded to was certainly a startling incident. He did not think he was altogether a coward, but certainly the first impression made upon him when he realised the position of his party was one of some alarm. There was, however, no ready means of escape from the position. They were wrapped round with the electrically charged cloud, and as the discharge continued so gently, familiarity with the situation soon bred a sort of contempt. They first stretched their alpen-stocks out to experiment with the wooden staffs upwards, and they then distinctly felt the electrical thrill passing through their bodies, and heard the crepitating currents rustling into the staves; thereupon they turned the iron points upwards, and the crackling sound was immediately increased, and the thrilling sensations became much more powerful, they then experienced the sensation very strongly both in the temples and at the fingers-ends. The direction-plate was of brass, and marked with lines to indicate the points of the compass and the direction of certain prominent objects in the surrounding country, and was mounted upon stone; it was covered by a large iron hood some two feet or so across; there was no electrical discharge of any kind upon it. He had no doubt whatever that the points of the flag-staff and of the alpen-stocks had really served as efficient safeguards to his party, lessening the tension of the electrical charge which was immediately around them: there must have been an enormous discharge during the time they remained upon the summit, for it was continued unceasingly for three-quarters of an hour.

Mr. D. PIDGEON said he spent last winter with his family in a house built upon the cliffs which form the promontory of Roundham Head, in the parish of Paignton, about three miles from Torquay. It is a bold head occupying a central position in Torbay, and juts well out to sea, the house occupying a very exposed position, with the sea a near neighbour on three of its sides. From the grounds, a door upon the cliff gives private access to the shore by means of steps roughly hewn out of the sandstone rock; and these formed a favourite position for watching the beauties of the bay both in calm and stormy weather. Hard by the door stood a flag-staff originally put up for the use of the coast guard, but now forming part of the property. It consisted of a single mast, 50 feet high, very strongly made, and substantially erected, having a metal vane at the top, and stayed about 25 feet from the ground in the usual way, with galvanised iron wire guy ropes. About a foot above ground the wire ropes terminate in half-inch cable chains, which are carried some way into ground to an anchorage. These chains are much corroded, the metal in some of the links being reduced to about one eighth of an inch diameter, while others remain of about their original size. The soil in which the chains find an anchorage is red sandstone conglomerate, which from its position is perfectly drained and very dry.

February 25th was a day of incessant rain from early morning till mid-day, with a cold wind blowing strongly from SE. Soon after noon the clouds broke, and the afternoon was made very beautiful by a series of brilliant and changing atmospheric effects. Windgalls were frequent, and the sky now bright, but streaked with "mare's tails," now dark with a passing scud. At no time during the day had there been any sign of thunder. About 5 p.m., tempted by the beauty of the bay, his wife, his son, and himself were on the shore, when a scud came up with the wind and approached them rapidly; they watched its course over the bay from Berry Head, and when it neared, fearing a wetting, they made their way homewards by the rock stairs. The first drops of the shower fell as they reached the flag-staff; and proving to be hail, they halted, standing in partial shelter grouped around the staff, while waiting for the scud to pass. His wife and son occupied the doorway, the former looking over the door out seaward, the latter close to her, and both a distance of 10 feet from one of the mooring chains. He stood some 20 feet from them, and 10 feet from another mooring chain. While in this position a flash of lightning struck the flag-staff, breaking the mast short off immediately below the metal vane as well as at a point 11 feet lower, rending into shivers all the wood between the vane and the point of attachment of the wire guys, and scattering the splinters in every direction, while the wreck of vane and mast fell within a few feet of their party.

On examination, it was found that the broken staff was blackened round half its diameter, the edges of this discoloration forming ragged splashes; the brass tube of the vane was ripped open for four inches along the joint at top and bottom; and all solder about the vane was melted. Three of the mooring chains were broken, the links being snapped short across in many places, and some of the links fractured in more than one place. The broken surfaces were bright and crystalline, showed no signs of heat, and no diminution of sectional area at the points of fracture. About 20 links altogether were broken, some above and some below ground; many of those which had suffered most from rust were snapped, not across the reduced but across the full section of iron. It is worth noting, that one of the rusty chains had given way in a gale some time before this occurrence, and that his son had mended it temporarily with an S hook made of galvanised wire not more than one-tenth of an inch diameter. In this chain several links were broken through their full and uncorroded diameters, while the slight wire S hook remained intact. Fragments of the shivered wood were found 150 feet to windward, measured distance; those flying to leeward would fall into the sea. The flag-staff formed the centre of a wide circle of gravelled path, from which other gravelled paths led to various parts of the garden. At the point where each mooring chain entered the gravel a notable pit-like depression was formed, and a walking-stick could be easily thrust into the ground for nearly a foot in each pit. On one of the paths radiating from the staff, and about 20 feet distant from it, stood an iron garden-roller. A shallow trench in the gravel forking into two sinuous scores radiated from the mast towards this roller. The shorter of these, eight feet long by four inches wide and three-quarters of an inch deep, terminated in a splash of gravel on the periphery of the roller at its point of contact with the ground. The longer score left the roller on one side, and was lost in the gravel some four feet beyond it. Two other similar but small scores were traced about an iron drain grating in the same path, and a score six feet long ran along the gravel path to the spot where he stood. All these scores or trenches were roughly radial to the staff.

Very heavy hail followed the flash, and the sky became exceedingly threatening; the wind fell instantly on the discharge to a dead calm. Twenty minutes later a second but distant flash was seen, after which there was no more lightning.

To observers placed any where within three miles of the spot, the lightning appeared as of very exceptional intensity. The coast-guard officer, distant some quarter of a mile, compares the explosion to that of a 300-pounder gun. His servants in the house, distant 150 yards, " never saw such a flash," and a scientific friend at Torquay described both flash and crash as "terrific."

In describing the effects upon themselves, he felt so strongly the danger of including subjective matter, that he would confine himself strictly to repeating the statements which they made to one another respecting their sensations immediately after the occurrence, and before their minds had time either to forget or add, in any degree, by reflection to the facts.

Of the three, his wife alone was felled to the ground, his son and himself remaining erect, and all three retaining consciousness. When the flash occurred, his wife was looking seaward over the door, as mentioned above; but they found her lying on her back upon the ground in precisely the opposite direction, her face being turned away from the bay. None of them have any certainty of seeing the flash, and his wife is quite sure she saw nothing. Similarly, none of them heard the terrific explosion accompanying the discharge, but his wife was conscious of a " squish " recalling squibs to her mind, his son of a loud "bellow," while he seemed conscious of a sharp " spang " with little hold on its objective reality. His wife describes her general sensation as that of " dying away gently into darkness," with a distinctly subsequent feeling of being roused by a tremendous blow on the body. On raising her from the ground she complained of great pain in the legs, which refused to carry her, and they had to support her into the house. The lower limbs remained paralysed for some time, giving at the same time great and alarming pain; but this passed off in less than an hour. On undressing her a distinct smell of singeing was noticed, and she was covered from the feet to the knees with tree-like marks branching upwards of a rose red colour, while another large tree-like mark, having six principal branches radiating from a common centre and 13 inches in its largest diameter, covered the body.

worthy of remark, that the centre of this figure, coincided exactly in height the ground with the iron bolt of the door against which his wife was ng, and it also marks the spot where she was conscious of having received a nt blow.

s son affirms that he received a violent shock in both legs, and that it was rical in character, while he was conscious only of a sudden and terrific ral disturbance affecting chiefly his left arm and throat, but with nothing rical about it. It is certain that some appreciable time elapsed before any em referred the occurrence to its true cause. His wife remained under the ession that they had been fired upon, and that she was wounded, until he her that the mast had been struck by lightning. His son and himself had a momentary feeling of intense anger against some "persons unknown" hat they thought was a trick. He did not think he recognised lightning fter his first glimpse of the wreck lying on the ground around them. His is the only one of the three who had any sensation of smell, and she is quite on the point. The lighting of a match was sufficient to bring the occur- back vividly to her mind for a long time afterwards. For a very few ents, both his son and himself failed to articulate, their mouths moved in an npt to speak, but the first few words on both sides were quite unintelligible. there was an unconsciousness to surrounding objects of some seconds' ion, is clearly shown by the fact that none of them saw or heard the heavy fall to the ground, though, descending through 50 feet, it must have taken st two seconds to reach the earth. The accompanying diagram represents

rect drawing of the chief lightning impression on the skin described above, h was carefully made from measurements taken at the time. The branches about a quarter of an inch in width, bright rose red, and were all faded in four to five days. The skin, where reddened, was sore to the touch like ld or burn.

. TRIPE said he did not propose discussing Dr. Mann's Paper, but desired to some remarks about Ball Lightning. On the 11th of July of last year he watching the progress of the most fearful storm he ever witnessed of hail, wind, and lightning, and was looking due south, where he saw a large ball e rise apparently about a mile distant from behind some low houses. His e is situated on the borders of the London Fields, which are, in that part, t a third of a mile across, so that he had an uninterrupted view of the omena. The Ball, which appeared about the size of a large cricket ball, at rose slowly, but accelerated its pace as it ascended, so as gradually to acquire y rapid motion. When it had risen about 45°, it started off at an acute angle rds the west with such great rapidity as to produce the appearance of a flash rked lightning. It made three zigzags before it entered the dark cloud, from

which flashes of sheet lightning were coming. About 10 minutes afterwards he saw a similar ball, which, however, rose more to the west, in the direction which the electrical cloud was taking, when a similar occurrence took place; the ball rising to about the same elevation before starting off as a flash of forked lightning. These balls seem to be dissimilar to those which descend, as the pace is greater at the latter part of its course and the colour lighter. The colour of the ascending ball lightning which he had seen was light yellow, whilst that of the descending ball was bluish.

Dr. C. J. B. Williams remarked, in reference to Mr. Pidgeon's description of his stroke by lightning, that he neither saw the flash nor heard the sound, that such was the common experience of those struck by lightning—they were so stunned by the shock to the nervous system that all sensation was suspended for the moment: when they recovered consciousness they could not speak for a time, because the muscles concerned in speech were benumbed from the same cause. With respect to the ball of fire, moving deliberately and then passing into a flash of lightning, he must doubt the identity of the phenomena. After such evidence, he would not question the reality of the ball of fire as an electric meteor; but its slow motion and course must distinguish it from the lightning flash, which darts from east to west—from one horizon to its opposite—in an inappreciable instant of time. To find its analogue in experimental electricity, we must seek for the representation of the ball of fire in the brush or star, or some such slow corruscation of electric light, and not in the vivid and instantaneous spark from the battery discharge, which truly represents lightning. To turn to a more practical part of the subject, he wished to call attention to the remarkable liability of some districts to thunderstorms, and their great need of efficient protection. Two years ago he visited Gais, a high village of Appenzel, in Switzerland, famous as a resort for the milk-cure. He was surprised to see that every house had its lightning rods, in number varying from two to eight, according to the size and complexity of the building. On inquiry, he found that the place was subject to the visitation of thunderstorms so terrific and frequent as to keep the inhabitants in continual dread; and in spite of the protection of the conductors, conflagrations were very common. A storm, which raged for 10 hours, had occurred in the previous week: telegraph posts were shattered to splinters, and two châlets were burned to the ground, although each of them had two rods. He had met with nothing like it in other parts of Switzerland, however high and exposed. He thought this extraordinary proclivity to thunderstorms must be due to the fact that this district forms the first high land after the wide expanse of the lake Constance and the vast plains of Wurtemberg and Bavaria, which are comparatively low. Although rising little more than 3,000 feet in height, it formed the foremost spur of the Sentis range, and would attract the clouds charged with negative electricity which gathered from the plains below. Such was a place to test the efficiency of the protecting rods, and nothing was more likely to cause failure than want of moist conduction to the earth under the houses with projecting roofs, and where the underlying rock is dry limestone and conglomerate.

A preceding speaker had alluded to the danger in towns from the many zinc and iron chimney-tops without sufficient conducting connection with the earth, but he believed this danger to be confined chiefly to isolated buildings or scattered villages, where the chimney-cans are few. In large towns there is such a forest of metallic tubes more or less angular or pointed, that even with imperfect conducting power, they must draw off quietly a great deal of electricity, and render towns more safe than country. He would apply the same remark to large trees, which, although not perfect conductors, are moist enough to draw off a vast deal of electricity from the clouds. In his youth he resided opposite some of the highest trees of a large park, and he had often noticed during a thunderstorm a little column of smoke above some of the topmost boughs. After a few months these boughs were dead, doubtless gradually killed by the heating effect of the electricity in passing through their imperfectly conducting material. Often since in Hyde Park and elsewhere, he had noticed that the topmost boughs of the highest trees were dead, he believed from the same cause. Although heated and injured by its transit (like a fine platinum wire by a battery), trees gave proof that they do draw off electricity from the clouds, especially when wet, and thus diminish the danger to the adjoining country.

Mr. SCOTT said that there could be no doubt as to the occasional occurrence of globular lightning, which moved very slowly; the evidence of this was too strong to be controverted. With reference to the possibility mentioned by Dr. Williams of the tops of trees being killed by constant electric discharges passing through them, he would like to ask whether this was not more commonly attributable to the fact of excessive drainage, as in Kensington Gardens, having affected the health of the tree. He finally drew attention to the constant error of stating that the lightning rod drew the electricity out of the cloud, whereas it more correctly might be said to allow the electricity to escape from the earth.

Mr. BIRT said that on the occasion of the storm alluded to by Dr. Tripe, two elms situated near Leyton Green, about a quarter of a mile from his residence, were struck by lightning. The *upper* branches of one were completely withered, but otherwise the tree was uninjured. The path of the lightning is not only traceable, but distinctly visible, along the trunk of the other now standing; a portion of the bark between fifteen and twenty feet above the earth's surface of about six inches wide having been torn away. It was at this point that the lightning appeared to have left the tree; for below it the trunk is apparently sound, the lower branchlets having produced healthy shoots this spring. There were several trees in his immediate neighbourhood that have lost their upper branches, and he was disposed to regard lightning as the agent which had killed them.

Mr. WHIPPLE asked if Dr. Mann would state what was the electrical conductivity of bricks when wet. He thought that a house covered with a metal roofing would be as safe as if bristling with points. With reference to what had been said about locality, he would mention that some time ago a tree was struck by lightning in Richmond Park, and on going to see it he found that it was on a spur of a hill, stretching out from Richmond Hill. He believed that ball lightning was a reality; for a friend of his had described to him the track of a ball in his garden, which went off in the same way as mentioned by Dr. Tripe.

Mr. FIELD asked whether the pipes for the ventilation of drains might not be dangerous as attracting lightning, unless properly connected with the earth; and whether by proper connection they could not be made good lightning conductors.

Dr. MANN said, in reply to various remarks that had been made, and in allusion to some matters that had been suggested during the discussion, that these had been of so interesting a nature he could only regret there was not larger opportunity to dwell upon them adequately, because there were so many topics to deal with. In reference to the case of the metal chimney-pots in great towns, he quite believed they might, when very numerous and closely planted, conduce to silent and gradual discharge, and that this was one reason why accidents from them were not more frequent. Large masses of bad conducting material, metal-tipped with sharpish edges in this way, would carry off as much electrical discharge as small rods of good conducting capacity, and this would more especially happen where there were soot-blackened chimneys leading quite down from them to near the earth. In reality, there was no absolute distinction between conductors and non-conductors in electrical science, it was merely a case of degree. Every thing conducted in some degree, but more or less, according to its nature. In regard to resistance being increased in proportion to the length of the conductor as well as to its *smallness*, that was thoroughly well known to electricians, and he had already given the expression for the fact, as it had been ascertained by direct experiments, in scientific form in the paper. Mr. Cobb had correctly accounted for the accident to the "Shannon," but he thought he might also add that the old practice in regard to ships was to care more about massive terminations than points. He still found remnants of this tradition in the practice of Mr. Gray, who was the skilful successor of Sir W. Snow Harris in this particular branch of work. Wherever unpointed terminals were used, there would always be much greater mechanical effect produced at the termination of a conductor than within its main line. This was an additional reason for the adoption of points. He could not admit that there was resistance of any kind set up by points, the operation was entirely the other way; resistance was diminished the instant a pointed form was given to the termination of a conductor. But he must add, that he doubted whether Mr. Lecky really meant "resistance" when he used the word. He simply, he believed, wished to bring prominently out the fact, that when points were employed there was a double

action set up by them,—an influence in a double direction,—a stream of electrical force was poured out from the earth through the point to the air or cloud, and another stream was simultaneously drawn from the cloud to the earth. In this Mr. Lecky was unquestionably right. The well-known experiment with the discharge of a Leyden Jar through a card points to a double passage even more strikingly than Mr. Lecky's double trail left upon the glass from a discharge by overflow. Points of metal connected one with the inner and the other with the outer coating of the Leyden jar, are placed touching opposite surfaces of a card, and when the discharge is passed through the card both surfaces are found raised outwards; there is a convex burr in both directions. This is generally accepted by electricians as indicating that the opposed forces cross each other in opposite directions whenever there is an electrical discharge. The term "ascending" and "descending lightning" can only be tolerated by exact science if taken in the limitation of expressing the direction in which the mechanical or material effects of the discharge are propagated. M. Callaud, in reference to this very question of the cross passage of the double discharge, says, "The lightning does not fall. The two electrified bodies produce between them an exchange of fluids, when the electrical tension of these fluids is sufficiently intense to conquer the resistance of the insulating substance which separates them." "Le ruban de feu qui unit le nuage à la terre va aussi de la terre au nuage." The transport of ponderable matter can only be looked upon as an indirect and secondary mechanical effect of the discharge, and can never be taken as indicating the direction of the movement of the discharge itself. Mr. Smith was assuredly within reason in his inference as to the large amount of the electrical discharge through the flag-staff and alpen-stocks on the Linguard. Arago estimated the amount discharged by a system of points placed upon a palace by Beccaria, under somewhat similar conditions, as being enough to kill 3,000 men in the hour. In considering the interesting instance supplied by Mr. Smith, however, it must not be overlooked that the flat direction-plate and iron hood were mounted upon stone, which is a much worse non-conductor than wood, such as formed the staffs of the flag and of the alpen-stocks. Dr. Williams's view as to the physiological influence of the Torquay discharge upon Mr. Pidgeon and his companions is unquestionably philosophic and correct. When Prof. Tyndall accidentally received the shock of the large Leyden Battery of the Royal Institution through him, he was quite unconscious of having been struck by it, and felt absolutely nothing. Mr. Pidgeon's case was, in all probability, a strictly analogous one. He states that he was quite unable to say absolutely whether he felt any shock. He was puzzled and confused, and seems most inclined to think he was not struck, because he could not distinctly bear testimony to the shock. His state of brief inability to feel and move, however, sufficiently manifests that some discharge did pass through him. In the case of Mrs. Pidgeon, the mark of the discharge was left stamped upon the skin. In Mr. Pidgeon's instance the full lightning discharge obviously did not pass through him and his companions. Either they were under the influence of a secondary return shock at the instant of the discharge of the lightning; or the discharge passed from the chains at the bottom of the metallic stays of the flag-staff expansively and centrifugally to a very large area of the imperfectly conducting ground, affecting every thing in a comparatively slight degree through a very large space, the living bodies chancing to be placed there amongst the rest. In a somewhat similar case, recorded, if his memory did not deceive him, by Mr. Walker, the lightning was once seen to make its escape through a dry earth-contact of a lightning-rod of a house in Philadelphia, as a broad sheet of fire several yards in extent. The Ball-Lightning is a well-known and carefully observed phenomenon, and is in every case diagnosed and distinguished from ordinary lightning by its very slow progress, allowing, indeed, ample time for its movement to be leisurely observed. But the "fire-balls" Mr. Pidgeon speaks of were manifestly not of this character, they were seen by persons "*standing with their backs to the discharge.*" They were simply the glare of the instantaneous light filling for an instant the space immediately around the spot most immediately affected by the final communication with the earth.

The disruption of the chains is one of the interesting incidents of Mr. Pidgeon's case. Mr. Pidgeon states that not less than 20 links were broken across. This was due certainly to molecular disturbance mechanically produced

the substance of the chain at the instant of the discharge, and possibly taking ›ct most violently at parts of the metal which were already in a state of flaw, approximate disruption. The power of lightning to contract materially the gth of metallic masses when it passes through them has been observed in ‹ious instances. Mr. Walker has placed upon record one case in which a wire s so shortened in a house in Stoke Newington by the passage of a discharge lightning through it, that a night-bolt, with which it was connected, could no ger be thrust into the fastening which previously received it. Some action of s kind possibly contributed to the fracture of the chain links at Torquay. The struction of the vitality of the upper branches of trees by electrical action, ›ken of by Dr. Williams, is a well-known effect. M. Viollet-le-Duc describes pace of 500 metres square, in the forest of Compiègne, in which all the upper anches of the large trees have been stripped of foliage by electrical agency, hough the lower branches of the same trees are untouched. The cups of an ›mometer, such as are spoken of by Mr. Field, are of such small dimensions, t they could hardly be considered in themselves as causing any material in-ase of danger. But the correct principle, of course, is that such objects should dominated by a lightning conductor. The stripping of the gilding from the umn beneath the chain cable affected by the lightning discharge brought under ice, was most probably due to inductive influence, and to a secondary lateral charge. It has already been suggested by Mr. Preece that pipes used to itilate the sewers might be converted into lightning conductors. To use them that purpose, it would only be necessary to see that they were of sufficient lensions, and to furnish them with good terminal points, and with good earth amunications.

[A larger copper tape than the one previously described, two forms of copper ltiple conductors, and a plan for securing metallic conductors against the uence of corrosive fumes by tubes of ebonite, were exhibited at the close of Meeting by Messrs. Sanderson and Proctor.]

Dr. Mann finally drew attention to various subordinate matters that, in nection with this subject, especially require a more extended investigation, l he especially referred to the dimensions of conductors; the effects of the ctice of coating good conducting substance with metals of inferior power; th-contacts in general, and especially the competency of the ordinary graphic methods for testing maintenance of efficiency in them; the nomena of return shocks, and of lateral and divergent strokes; the area of olute protection; the systematised connection of metallic masses; the cause the disruption of chain links; protection of lightning conductors from rosive fumes; the protection of chimney shafts; the molecular change effected copper by time; the height and distribution of the upper terminal of lightning-s; and the best construction of points. He also stated that it was under the sideration of the Council of the Society to determine whether a permanent htning-rod Committee for the further investigation of such matters might not advantageously formed. If such a Committee were constituted, its immediate ctions would probably be threefold. 1st. To collect and record facts relating accident and injury from lightning. 2nd. To investigate certain moot points scientific principle and construction, such as those which had been specified. l 3rd. To report and publish the progress of its labours in both directions from to time.

XIX. *On certain Small Oscillations of the Barometer.* By the Honourable

Ralph Abercromby, F.M.S.

[Received March 1st. Read May 19th, 1875.]

tain small oscillations in the height of the mercury in the barometer, netimes called "pumping," have long been known to be associated with ts of wind, but I do not think that the precise nature of their action has been

determined. In this country the oscillations rarely exceed 0·02 inch; and in studying them, I have found the aneroid preferable to the mercurial barometer, owing to the absence of inertia.

The two following examples may be considered typical:—

1873, Southend.—Window looking S; wind nearly S, in strong gusts. In this case the first motion of the barometer was always upwards about 0·01 inch, as if the effect of the wind, being arrested by the house, was to compress the air in the room.

1874, Brighton.—A corner house, one window to S, another to W; wind S, strong gusts. With the W. window open there was violent "pumping," but in this case the first motion was always downwards. On opening the S. window as well, the pumping ceased.

The explanation seems to be, that the wind blowing past the W. window drew air out of the room, as blowing through a spray-producer causes suction; but when the S. window was opened, as much air came in as was drawn out, and the pumping ceased.

I believe that all more complicated cases of pumping are modifications of these two examples. I have always remarked that pumping is least marked on the lee side of a house.

It is well known to medical men that many acute diseases, or chronic conditions of exaggerated sensibility of the nervous system, are aggravated by strong wind. Sharp rheumatic pains, breathlessness, and general distress are very common symptoms. Animals indoors are also often uneasy during high wind. In several cases of human beings which have come under my own experience, I have observed the distress to be associated with pumping of the barometer. If we remark that the difference of 0·01 inch of pressure means a difference of 35 grains weight on every square inch, or more than 14 lbs. on the whole human body, and that this change takes place in a very few seconds, it is obvious that "pumping" really involves a very considerable shake to the nervous system.

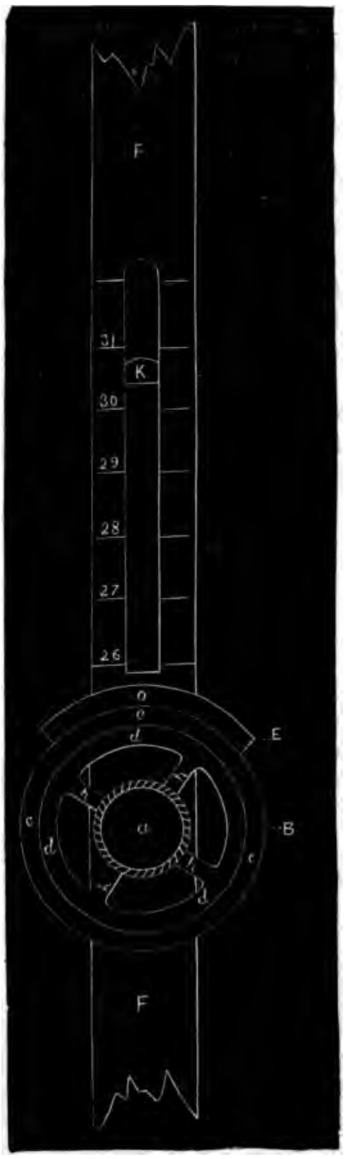
The above observations, however, suggest a few practical methods of palliation, which may be shortly stated thus:—If open windows can be borne, try, by crossing or otherwise altering the drafts, to diminish the distress. When, as in most cases, windows cannot be open, all doors and windows should be closely shut, as well as the vent of the chimney, if there is no fire; and if possible, the patient should be moved to a room on the lee side of the house.

The oscillations due to "pumping" must not be confounded with the small rises and falls which occur in squalls and thunderstorms. These present many points of interest, which I hope to make the subject of a future memoir.

XL. *Proposed modification of the Mechanism at present in use for reading Barometers so that the third decimal place may be obtained absolutely.* By R. E. Power, L.R.C.P.

[Received April 17th. Read May 19th, 1875.]

Whilst recently engaged in the endeavour to manufacture a barometer on Fortin's principle, I experienced great difficulty in accurately marking the graduations; and, in fact, I found it quite beyond my mechanical powers to attempt, without the aid of a dividing machine, graduations to read higher than two places of decimals. Under these circumstances, it occurred to me to utilise the circle in the application of the vernier, and thus obtain greater latitude with the same relative value. The result I now have the honour to submit in a drawing to the Meteorological Society.



In my proposed modification of the index at present in use, I believe that it possesses three advantages:—

1st.—Diminution of liability to error in manufacture from the increased length of the degrees: the line of the division bearing but a small comparative value to the degree, whereas in a graduation measuring 0·022 of an inch, the divisional lines must form no inconsiderable part.

2nd.—Diminution of liability to error on the part of the observer. The instrument being read in a perpendicular plane, the altitude of the eye becomes immaterial.

3rd.—In the third decimal place being found absolutely, whereas in Fortin's instrument it is approximately ascertained.

I trust the accompanying sketch will convey sufficiently lucidly the details of the mechanism.

Description of Woodcut.

By turning the milled head *(a)* the graduated disc *(B)* is made to revolve; and the axis of the milled head being constructed as a pinion, works at the same time the ratchet, which is attached to the index *(K)* moving it, as in the usual method of barometers.

The vernier *(E)*, which for symmetry is duplicate, and reads from the central zero both ways, is fixed.

B is a graduated disc; *c c c* graduations into 100 parts; *d d d* graduations into 10 parts; *h h h h* spokes connecting circumference with axis.

The movements should be so constructed that one complete revolution of the disc should coincide with the displacement of the index one inch.

The zero of the disc is opposite zero on the vernier, whenever the lower edge of the index corresponds to an inch mark on the tube.

The revolution of the disc will then show tenths and hundredths of an inch directly; read from the zero point of the vernier, and the vernier will give the thousandths.

A convenient size for the disc would be an external circumference of 10 inches (nearly 8·8 inches diameter), so that 0·01 inch reading of barometer would be represented by 0·10 inch on scale, and 0·10 inch reading by *nearly* one inch on scale. The divisions on the vernier would, of course, be 0·11 inch, and would read to 0·001 inch.

The principle involved in this modification of Fortin's instrument is, that the graduations being expanded to any convenient dimensions by means of the circle, greater accuracy is obtained: the relative value of any part of the degree being in inverse ratio to its dimensions.

Error in reading from the varying position of the observer's eye is also avoided, and finally, the third decimal place is obtained absolutely, instead of approximately, as with Fortin's instrument.

XLI. *On a White Rain or Fog Bow.* By G. J. Symons, Secretary.

[Received June 1st. Read June 16th, 1875.]

The following short paper consists of two portions: the first is a narrative of certain phenomena observed by Lady Orde and one of her daughters, and communicated to me by Sir J. P. Orde, Bart., F.M.S.; the second is an epitome of previous records of somewhat similar phenomena.

On January 27th, 1874, at 2.20 p.m., Lady Orde and one of her daughters were walking down a very steep hill about two miles south of Ardrishaig (Crinan Canal entrance), on the west shore of Loch Fyne; they were about 150 ft. above the sea, walking nearly north-east, and looking towards Silvercraigs Point, or between it and Ardrishaig; there was no mist, neither was there any clear blue in the sky, it was generally greyish, with light fleecy clouds, upon which appeared a pearly, rather than neutral tint rainbow. Its colour did not tell out attractively, but very peculiarly, owing to its distinct form and striped character. The stripes were of a warm, neutral tint, white and greyish. The bow stretched across the hill side and sea, from about W or NW to E or SE, and was fainter at its western than at its

eastern extremity. It seemed rather broader than an ordinary rainbow, but this might be due to the absence of colour. Sir J. Orde was driving along the *shore* of Loch Fyne, in the opposite direction, to meet them, and did not see the bow; his recollection of the weather does not quite agree with that of Lady Orde, as he reports the day as "hazy—a very unusual thing here—and more so in N and W than elsewhere." He was never, probably, 20 feet above the sea level.

I am glad to be able to supplement the above very accurate description by exhibiting a sketch of the phenomenon made subsequently from memory by Lady Orde, which, although transmitted with some depreciatory remarks, undoubtedly gives a very good idea of the general appearance.

The completeness of the above narrative is equally remarkable and satisfactory; remarkable because few persons would have been able to give so lucid a description, and satisfactory because when a rare phenomenon occurs it is still more rare to obtain a complete account.

But a white rainbow sounds like an absolute anomaly, and one naturally tries to imagine it a fog bow, or part of some system of halos. I do not see that we can accept the first theory in the face of the positive statement, "there was no mist," and even Sir John goes no further than "it was hazy in the distance:" and the halo theory hardly seems better; for, in the first place, I know of no halo system which would give such an arc as herein described; and in the second place, I should think that if this supplementary arc was so plainly visible, the primary arcs could not have escaped the notice of Sir J. Orde, who would be driving face towards them.

Whatever may be their nature or explanation,—and on such optical questions I am not prepared to enter,—white rainbows have been previously mentioned in meteorological works. I think that it will be useful to reprint such of these notices as I can readily find, so that the present communication may serve in part as a monograph upon the subject; and if it leads some competent person to consider the phenomena carefully, and to demonstrate their nature and cause, a desirable end will have been reached.

I offer no comment on the various opinions and statements which follow, except this, that it is certain that nearly all the writers have failed to distinguish between white rainbows and fog bows—if, indeed, any difference exists.

Climate of London. By LUKE HOWARD, F.R.S. Three vols. 8vo., London, 1833. Vol. II., p. 72 and p. 189.

1809, March 27th.—Very misty morning. The mist as it broke away exhibited a faint white *bow* in the NW.

1812, November 20th.—Misty; much rime on the trees. At 11 a.m. a perfect, but colourless *bow* in the *mist;* near 4 p.m. there was a shower, in which the rainbow showed its proper colours.

[This statement respecting November 20th, 1812, is reprinted verbatim from Howard's original report in the *Annals of Philosophy* for January 1813, p. 80.]

Introduction to Medical Literature. By THOMAS YOUNG. 8vo., London, 1818, pp. 559-560.

I have had an opportunity of ascertaining that the clouds which exhibit the white and coloured circles sometimes denominated 'glories,' are certainly not composed of ice particles; and I have succeeded in deducing an explanation of these phenomena from the same laws which are capable of being applied to so many other cases of physical optics. In the theory of supernumerary rainbows (*Nat. Phil.* Vol. I. p. 471, plate 30, fig. 451; Vol. II. p. 648), I have observed that the breadth of each bow must be greater as the drops which afford it are smaller; and by considering the coloured figure in which their production is analysed, it will be obvious that, if we suppose the coloured stripes extremely broad, they will coincide in such a manner in one part as to form a white bow; the red, which projects beyond the rest, being always broadest; so that if all the stripes be supposed to expand while they preserve their comparative magnitude, the middle of the red may coincide with the middle of the blue; and it will appear on calculation that a white bow will be formed a few degrees within the usual place of the coloured bow, when the drops are about $\frac{1}{3000}$ or $\frac{1}{4000}$ of an inch in diameter.

It is remarkable that in such cases the original bow is altogether wanting, and probably for a similar reason we scarcely ever see a rainbow in a cloud which does not consist of drops so large as to be actually falling, although I have once seen such a rainbow ending abruptly at the bottom of a cloud: it may be conjectured that the edge of the light is in such cases so much weakened by diffraction, that it is too faint to exhibit the effects occasioned by a larger drop.

Researches about Atmospheric Phenomena. By THOMAS FORSTER. Third Edition, 8vo., London, 1823, p. 104.

The Iris unicolor is more properly a colourless rainbow, and appears in the mist. Such a one appeared on 20th November, 1812, in the vicinity of London. The afternoon of the same day there was a shower, in which the rainbow showed the usual colours. ('*Thomson's Annals*,' 1813, p. 80.)

Edinburgh Journal of Science. Edited by SIR DAVID BREWSTER. Vol. V. p. 85, 1825, 8vo.

[Extract from Letter by Mr. Coldstream, of Leith.]

On February 7th, 1825, two colourless rainbows were seen, one at 9 a.m., the other about noon. Much rain had fallen during the preceding night, and the morning had been cloudy; but at the time of their appearance there were no clouds visible, except towards the western horizon.

In the zenith the colour of the sky did not equal the tenth degree of Saussure's cyanometer. The primaries only were seen; they were vivid and distinct throughout their whole extent, and had the ordinary breadth of th

common rainbow. While I was observing the one which appeared at noon, I saw its northern limb fall upon a portion of a nimbus in motion, and immediately assume the proper colours; but whenever the cloud had passed, the bow regained its colourless state. This phenomenon is, probably, rare; I am not aware of its having been observed by any of the older meteorologists.

Meteorology. By G. Harvey, F.R.S. 4to., London, 1848.

[This Article is too long for quotation: I, therefore, merely make a few extracts.]

"Sometimes a small portion only of a rainbow is exhibited on a few light clouds. As these advance the arch may increase, and the whole rainbow at length become complete. The other extremity may then fade and become reduced to a pale white, and the whole may eventually be reduced to this state. In an instance of this sort, Howard thought the rain was formed and propagated in the atmosphere with such rapidity as scarcely to afford time for the formation of drops in the form of cloud."

"A colourless bow may soon be followed by one having the usual colours."

"Perfectly colourless bows have been seen in mists. On the clearing up of a considerable fog, and when the sun was just visible, a rainbow of this sort was seen whose breadth was about double that of an ordinary rainbow, and its colour grey; near the ground the colour was brighter than towards its centre; near the extremity of the bow were streaks of white of peculiar brightness."

Introduction to Meteorology. By D. P. Thomson, M.D. Edinburgh, 1849. 8vo., pp. 222-223.

It has been experimentally proved by Sir David Brewster (*Edinburgh Journal of Science*, Vol. X. p. 163) that the rainbow consists wholly of polarised light, in consequence of the rays having been reflected nearly at the angle of polarisation, from the posterior surface of the rain drop. The value of this observation is great. In the language of the Baconian philosophy, it is an *instantia crucis*, demonstrating the correctness of Newton's theory of the rainbow, which we have explained. When the spectrum is formed from a very slender pencil of light, the yellow and the blue colours almost wholly disappear; and when obtained from one, the breadth of which exceeds the angle of separation of the red and violet, the green becomes invisible, and there is the semblance of two primary arcs separated by one of white or homogeneous light. Hence, when the sun's apparent diameter is least, as in summer, there is the greatest condensation of the colours; whereas in winter, the yellow and the blue predominate. This leads us to mention the phenomenon of *white rainbows*, which is by no means common. It is referred to by Howard (*Climate of London*) and Forster (*Researches*), and explained by Young (*Introduction to Medical Literature*, p. 586).

Coldstream (*Edinburgh Journal of Science*, Vol. V. p. 85) mentions two which were seen at Leith in 1825, and the author witnessed one on the 17th October, 1848, about 8 p.m., in England.

Meteorology (from the *Encyclopædia Britannica*). By Sir J. F. W. Herschel. Sm. 8vo., Edinburgh, 1862, pp. 219-221.

In reference to the formation of a rainbow on cloud or fog, in the entire absence of rain, Colonel Sykes, in his Paper on the Meteorology of the Deccan (*Phil. Trans.* 1835), relates a remarkable instance of one seen by him from the top of a precipice from 2,000 to 3,000 feet in perpendicular height, forming the north-west scarp of the hill fort of Hurrachandarnaghur, among the Ghauts, overlooking the plains of the Concan (Konkhun), densely covered with fog cloud, arising somewhat above the level of the precipice, but not covering it. Under these circumstances, having the sun at a low elevation at his back, he says:—"A circular rainbow appeared, quite perfect, of the most vivid colours, one half above the level on which I stood, the other half below it. Shadows in distinct outline of myself, my horse, and people appeared in the centre of the circle, as in a picture, to which the bow formed a resplendent frame. From our proximity to the fog, I believe the diameter of the circle at no time exceeded 50 or 60 feet. The brilliant circle was accompanied with the usual outer bow in fainter colours." In the same paper he also records his observation of a white rainbow in a fog-bank near Poonah, within which he was riding. "Suddenly I found myself emerge from the fog, which terminated abruptly in a wall some hundred feet high. Shortly after sunrise I turned my horse's head homewards, and was surprised to discover in the mural termination of the fog-bank a perfect rainbow, defined in its outline, but destitute of prismatic colours." Niehbuhr, in his *Voyage to Africa*, describes a white rainbow, and Mr. St. John, in his *Lives of Celebrated Travellers* (Vol. III. p. 121), mentions having seen one on May 21st, 1830, in Normandy, "on the morning mist." On the other hand, it should be mentioned that Mr. Smyth, in his recent sojourn on the Peak of Teneriffe, with a cloudless sky and perpetual sunshine above, and with a boundless sea of cloud continually extended in all directions below him, makes no mention of a rainbow being at any time formed upon it. The external portion of a very remarkable appearance observed by Mr. Cockin in Lancaster (*Phil. Trans.* 1780, p. 157) in a mist would seem, also, to have been the lower portion of a colourless rainbow. I may observe here, in reference to the note on p. 90, that in this account Mr. Cockin *does* distinctly notice, as matter of surprise, the "*little humid particles*" which occasioned the mist, and were floating around the bushes at about half an inch distance from one another," "where the sun shone" on them. But he does not call them *bubbles*, and it is evident that what he saw was not the watery globules themselves, but the infinitesimal spark of light from each of the globules constituting its contribution to the rainbow, which, if the focus of the eye were not adjusted to its distance, might easily

have been dilated into an annular appearance, or a disc mistakeable for a bubble. In reference to the usual want of colour in lunar and fog rainbows, it may be observed that the prismatic colours are not well distinguished in either very brilliant or very feeble spectra. And as regards the non-formation of rainbows on clouds at *very* great altitudes, any how they evidently could not be so formed, the particles of the cloud being not globules, but crystallised bodies.

A Treatise on Meteorology. By ELIAS LOOMIS, LL.D. 8vo., New York, 1868, p. 214.

Fog Bow explained.—If the rain drops be less than $\frac{1}{77}$th of an inch in diameter, the primary bow will be wider than 2°, the breadth of the bow depending simply upon the size of the drops. But as the breadth of the bow increases, the colours are spread over a greater surface, and consequently they are less vivid and distinct. When the diameter of the drops is $\frac{1}{1250}$th of an inch, which is the average diameter of particles of fog, the bow becomes a very faint arch 4° or 5° in breadth, with only a slight rosy tint upon the outside. Such is the bow actually observed when the sun shines upon a dense fog.

POSTSCRIPT.

Since the above Paper was read, I have received two additional notes on white bows, which are as follows:—

1. Mr. A. E. Murray, F.M.S., Manor House, Hastings, writes:—

"2nd March, 1874:—

"*Weather.*—Misty and damp, but fog not thick enough to hide the moon. On crossing the West Hill over the brow, but not a dozen yards off, as was evident by the hedges appearing on the further side of it, was a perfect arch of white light exactly similar to the rainbow, but entirely without colour, of considerably more than 180°. The moon was behind, and shining brightly on the mist. On receding from the brink the bow appeared to follow, and the size of the arc in degrees decreased, the slope of the hill being less. A quarter of an hour after there was not a sign of the bow, although apparently there was not much change in the mist, except that it was not quite so thick."

2. Rev. M. H. Close, Newtown Park, Black Rock, Dublin, says:—

"On Christmas Eve, in the year 1849,* I saw, near Kibworth, Market Harboro', Leicestershire, a quite colourless bow. It was very distinct nearly all round the semicircle (the sun was just going to set), except near the *feet*, where it was less bright. It had been freezing in the shade all day, and

* I am pretty sure it was 1849, the year of that No. of the *Year Book of Facts* which describes a colourless bow seen in Brazil in 1848.

the ground had become crisped again. There was a very slight haze, and the sky was a good deal covered with very light, thin, fleecy clouds. Two companions observed the bow as well as myself. By means of two unbroken *bents* of grass—which I found, on a little search, one transverse and the other giving the distance from the eye,—I took the angular diameter of the middle part of the breadth of the bow. On measuring the bents carefully at home, they gave an angle within $1\frac{1}{2}°$ of the similar dimension of an ordinary Iris; probably the angle was really the same as that of a coloured bow, but the rude method of measurement did not enable me to go nearer to the truth."

DISCUSSION.

Mr. Brooke thought that the explanation given in the paper was correct. The spherules of water are more minute in fog than in rain; and as the breadth of the coloured bands increases with the minuteness of the spherules, they would probably so far overlap each other as in some measure to reproduce white light.

The President called attention to the striped character of the bow, which indicated chromatic dispersion, or separation of the rays of different refrangibility. The bow was probably an arc of a neutral tint in which the distinct colours were made inappreciable by faintness.

Mr. Symons said that in the description it was stated that there was no fog or mist. He thought that there must be something exceptional in the phenomenon, or there would be other cases on record.

Mr. Brooke said this might be due to the mist not often presenting any definite surface on which the solar rays could fall. It is obvious that no bow could be formed in a continuous mist.

The President thought that if a bow were produced by rain, and a screen of cirrus intervened between the sun and the rain, this might diminish the intensity of the light sufficiently to render colour inappreciable.

Mr. Lecky said that he once saw a fog bow at Valencia. His shadow was thrown on the fog, and the bow appeared round his head with a white light. He thought that Mr. Brooke's explanation was the correct one, that the spherules of water in a fog are so small and numerous as to mix the colours and produce white light only.

Dr. Tripe said that the striped appearance of the bow in the drawing mentioned in the paper induced him to say that it was a rainbow, and not a fog bow. He once saw a fog bow in the Channel; this was called by the sailors a "fog eater," as the fog would rapidly disperse, which it did in half an hour. The bow was of an uniform white colour, not striped, and moderately bright.

Mr. Symons said that he would like to have it settled whether the phenomenon was to be termed a white rainbow or a fog bow; it was certain that at present all the best writers on meteorology used the terms indiscriminately.

Mr. Lecky thought that the fog-bow and rain-bow are the same, all differences depending on the distance and size of the drops.

The President asked if Mr. Brooke could conceive the peculiar striped aspect of the bow produced otherwise than by chromatic separation of the rays?

Mr. Brooke replied that he thought it conceivable that, under certain conditions, interference bands might be produced, which are independent of what is commonly understood by the term "chromatic dispersion."

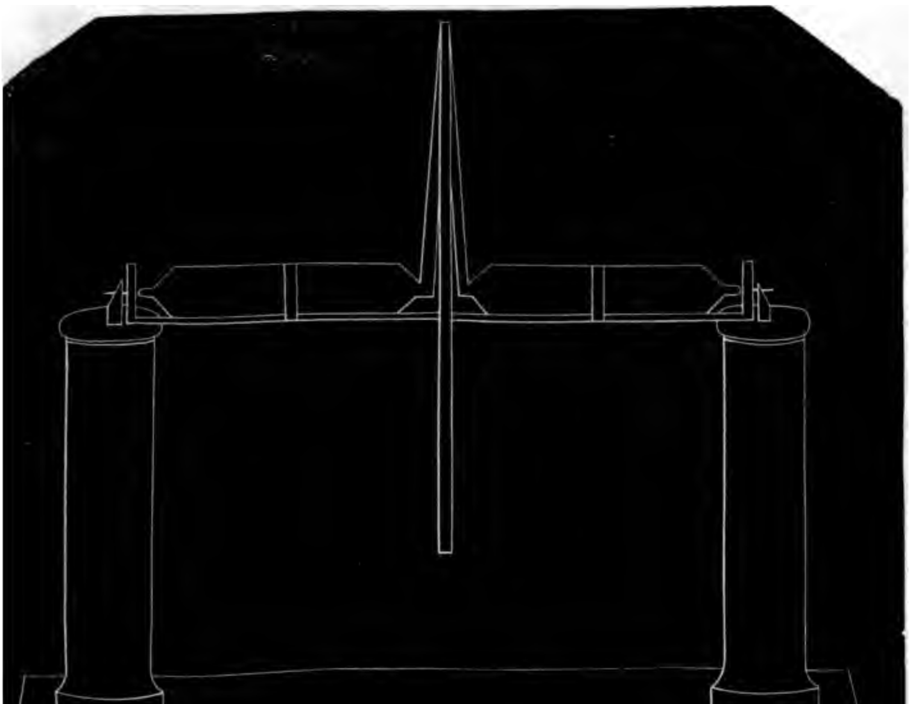
Mr. Scott said that after the last Meeting he observed, and doubtless many other Fellows did also, the appearance of a fine mock-moon on the western side of the true moon, having the colours of the rainbow, but with the red inside, as in the case of a halo. He was told that a mock-moon afterwards appeared on the eastern side also.

XLII. *On a Proposed Form of Thermograph.* By Wildman Whitehouse, F.R.A.S.

[Received May 18th. Read June 16th, 1875.]

In pursuing the study of the acid bulb hygrometer in the early part of the year 1872, it appeared to me most necessary to devise some plan of continuous registration, which, while obviating the labour of very frequent personal observation of the thermometers employed, should also give an unbroken chain of data on the subject.

Pondering upon this idea, with a Six's Thermometer before me, it occurred to me that if the parallelogram formed by two limbs of that instrument were made to take a circular form, and the spirit bulb and expansion chamber were each brought into the centre of the circle and placed axially, projecting in opposite directions at right angles to the plane of the circle, they might be made to form an axis, on which the whole instrument might rest, the point of stable equilibrium being determined by the position and weight of the mercury occupying the lower half of the circle.



light syphon pen or style for recording, by an easy conversion of the circular movement into a direct horizontal one.

The thermometer may be "pointed" and graduated in the usual way on that part of the stem which forms the periphery of the circle; and thus the scale errors of the instrument as a thermograph may be checked by observations of the thermometer itself.

There are on the table parts of the first model instrument with which the record was attempted, and the success was beyond my expectations.

We have also on the table the remains of a thermometer with which I tried to record the dew-point. This was done by cooling down a cylindrical bulb (one half of which was covered with muslin) by the use of ether; the other half of the bulb was subjected to a very gentle pressure by small strips of tissue paper placed, like bow-strings, on three light bow-shaped arms, carried round the bulb by an axis to which a step-by-step motion was imparted by a half-seconds clock. These arms pressed so lightly on the bulb as to communicate the slightest possible tremor to the instrument when dry; but, when dew began to be deposited, the adhesion of the paper to the glass as it swept round the bulb became very considerable, and the thermometer was rocked vigorously, so that the line was serrated deeply: this continued until the dew had again disappeared.

Thus the thermometer, recording the curve of temperature in the usual way, by a firm and steady line, was brought down to the dew-point by the use of the ether, when the line immediately became serrated, and remained so till the disappearance of the dew, when it again became smooth, and rose gradually to the existing temperature. A proof-sheet of this not unsuccessful attempt is now before you.

The counterpoising of these instruments was easily effected; but there is a difficulty, amounting almost to an impossibility, in obtaining a true circle in glass; and, again, there is the further difficulty of truly centering it. Unless this could be done, adieu to any precision in the record: even if this were attained in one instrument by extreme care and good luck, there would be the utmost difficulty in multiplying such instruments, if required to be made to the same scale with any degree of accuracy.

Lastly, there is the absolute impossibility of separating the thermometer from the recording part of the instrument, to which the necessary clock-work was attached, and this forbade its application to out-door use, which I deemed essential. I, therefore, reluctantly resolved to abandon the effort to carry out and perfect thermography in this direction; and am induced to lay this short account before the Society, in order that others may have the opportunity of availing themselves of the fruit of my labours. Right well pleased shall I be if they can be turned to account, and made useful by any one.*

* NOTE.—Several Thermograms and parts of the instruments used, together with the first model instrument as completed, have been presented by the Author to the Society.

DISCUSSION.

Mr. SCOTT stated that on a recent occasion Mr. Cripps had brought forward a self-registering thermometer at the Royal Society, which seemed to be more or less on the same principle as that of Mr. Whitehouse, which, to his (Mr. Scott's) knowledge, had been devised some years before. He had, therefore, requested Mr. Whitehouse to bring his instrument before the Meteorological Society, in order to have its construction placed on record. It was evident that—although the two arrangements agreed in so far as concerned the production of power sufficient to work a registering apparatus by means of the motion of the mercurial index of a spirit thermometer in a ring-shaped tube,—there was no further similarity between the inventions of Messrs. Cripps and Whitehouse.

Mr. WHIPPLE said that Mr. Cripps's instrument appeared to resemble in principle a contrivance employed by the late Mr. Appold for the purpose of regulating the temperature of his house. It consists of a tube sealed at both ends, and containing a column of mercury, upon the surface of which a small quantity of ether floats. The tube being balanced in an almost horizontal position, the varying changes of tension in the ether vapour produced by alteration of temperature cause the mercury column to move along the tube, thereby changing the position of its centre of gravity, and making it to rotate about an axis. Levers suitably fixed were adapted so as to control the admission of heated air or water, and hence maintain equability of temperature in the apartment in which the instrument was fixed. Two instruments constructed on this principle were in the Royal Society collection and were at the Kew Observatory for at least ten years, but have recently been transferred to the Museum at Burlington House.

XLIII. *On the Rainfall at Athens.* By Professor V. RAULIN.

(Translated from *Comptes Rendus*, Vol. LXXIV. p. 1124, by R. STRACHAN, F.M.S.)

[Received May 18th. Read June 16th, 1875.]

THE interest taken by every educated man in the countries of which the men and events have been the admiration of his youth, induces me to present to the Academy a summary of the rain-gauge observations made at Athens by M. Julius Schmidt, Director of the Greek Observatory. They give precise information about the degree of dryness of the climate, which, doubtless, is not very different to-day from what it was 2,000 or 3,000 years ago, and also during the Heroic times.

The observations embrace a period of twelve and a half years, from 1859, August, to 1871, December. The rain-gauge is square and has a width of 12·79 inches; it is placed at 51 feet above the ground, upon the terrace of a house situated to the north-east of the Acropolis, and at the western base of Mount Lycabettus, at 318 feet of altitude.

In respect to the *amount of rainfall in the year*, the results show that the wettest year has been 1864, and the driest 1862; the difference between the greatest and the least amounts, 18·67 inches, is much above half the greatest.

As regards the *distribution of the rain among the different seasons*, placing the wettest first, the order is Autumn, Winter, Spring, Summer. The means are as follows:—

Winter, 5·59; Spring, 3·20; Summer, 0·95; Autumn, 5·91 inches.

As to the *annual and tri-monthly quantities*, during the two wettest years, 1864 and 1871, the greatest abundance of water fell during Winter and

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
1859	..	..	..	..	..	..	..	·27	·09	·21	2·96	2·85	..
1860	1·49	3·58	1·64	·58	·46	·40	·70	·00	·08	·99	2·68	2·56	15·16
1861	·56	·05	1·37	·43	2·97	·83	·07	·39	·07	2·08	·13	3·56	12·51
1862	1·73	·65	·39	·13	·24	1·72	·10	·00	·26	·00	4·05	·36	9·63
1863	1·07	·10	2·91	·34	·07	·55	·00	·00	·21	·13	2·70	2·84	10·92
1864	2·98	2·96	·54	·46	2·19	.44	·00	·00	2·08	5·56	9·49	1·60	28·30
1865	1·82	4·36	1·74	·43	·02	·02	2·01	·16	·22	1·40	2·21	·67	15·06
1866	·84	·98	·92	·07	·84	·13	·00	·00	1·24	·89	5·32	3·13	14·36
1867	1·22	·10	·94	·69	·14	·87	·14	·04	·02	2·91	2·15	4·00	13·22
1868	2 79	·32	3·09	·48	1·16	·16	·06	·01	·24	1·95	4·27	·95	15·48
1869	1·56	·65	2·71	1·76	1·13	·48	·11	·76	1·13	1·95	1·13	2·55	15·92
1870	2·61	1·25	2·05	2·59	·25	·00	·00	1·15	1·23	1·85	1·02	3·18	17·18
1871	3·83	1·08	1·03	·86	·78	·13	·00	·00	·30	7·24	4.35	2·67	22·27
Means	1·87	1·34	1·61	·74	·85	·48	·26	·21	·55	2·09	3·27	2·38	15·83
Maximum	3·83	4·36	3·09	2·59	2·97	1·72	2·01	1·15	2·08	7·24	9·49	4·00	28·30
Minimum	·56	·05	·39	·07	·02	·00	·00	·00	·02	·00	·13	·36	9·63
Maximum in a Day	2·21	1·88	1·17	·59	2·09	1·43	2·01	·77	1·23	2·80	3·86	1·49	..
Mean Number of Days of Rain ..	11·9	9·2	11·6	7·8	6·1	4·0	1·9	2·8	3·9	8·5	12·7	13·1	93·5

Autumn; during the two driest, 1862 and 1868, Summer and Autumn, or, rather, Winter and Summer, have been the dry seasons.

Lastly, as regards the *distribution of rain during the different months*, the monthly means of the twelve years, 1859 to 1871, establish a division into two parts; the one, of six wet months from October to March, and the other, of six dry months from April to September. A distribution of the quantity of rain gives the following results:—

15·65 inches over 12 months, gives per month 1·80 inches.

12·56 inches over 6 wet months, gives per month 2·09 inches.

3·09 inches over 6 dry months, gives per month 0·51 inch.

As regards the *maximum quantities of rainfall in one day*, the Mediterranean characteristic of torrential showers is well shown, notwithstanding the low annual mean. In fact, in the months of October and November as much rain as 2·96 to 3·86 inches has fallen in one day; and in four other months the maximum has almost attained or even exceeded 2 inches.

As regards the *mean monthly and annual number of days of rain*, it is 93·5 for the year, counting those on which merely a few drops of water fell; but it would certainly be reduced to two-thirds if all those on which less than ·04 inch of water fell were suppressed. These 93·5 days are spread over the seasons in the following manner:—Winter, 34·2; Spring, 25·5; Summer, 8·7; Autumn, 25·1.

Notes by the Translator:—The following corrections have been made in the original table prior to the conversions of the quantities:—

1862 rainfall, 286·8, should be 244·8 mm.;

1868 rainfall, 392·5, should be 392·8 mm.;
1869 rainfall, 934·6, should be 404·6 mm.;
November mean, 75·2, should be 82·9 mm.;
December mean, 52·7, should be 60·4 mm.;
March maximum, 78·8, should be 78·5 mm.

In consequence of these errors, the following are given wrongly in the original:—The driest year, and difference between wettest and driest years; amounts for Winter and Autumn; the amount for twelve months and its monthly mean; the amount for the six wet months, and its monthly mean.

The conversions have been made on the basis of the value of the metre at equal temperatures in ordinary air, namely 1 m = 39·38203 inches.

XLIV. *On the Barometric Fluctuations in Squalls and Thunderstorms.* By the Honourable Ralph Abercromby, F.M.S.

[Received May 19th. Read June 16th, 1875.]

When I first observed that the barometer rose in thunderstorms, in 1868, I was unable to get satisfactory results with an aneroid. I therefore procured a standard Fortin mercurial barometer, 0·4 inch bore, for the express purpose of carrying out this investigation. I soon found, however, that practically the instrument was useless, as the time required to set and read the vernier alone is too long for such rapid changes, amounting sometimes to 0·01 inch a minute. I was, therefore, obliged to seek the sources of error in the aneroid barometer; and before discussing my observations, I wish to make a few remarks on the precautions which are necessary to secure trustworthy results. It is most important that the instrument should neither be tapped nor shaken. For this reason it is safer to place it on a wall or bracket, rather than on a table. Violent shutting of windows, heavy treading, or anything that may shake the room should also be avoided. Still more important is it that no door should be suddenly opened. The wave of air to which such a proceeding gives rise jerks the chamber of the aneroid, and disturbs the bearings. This is the wave that rattles the windows when a door is opened suddenly. Parallax is obviated by two methods. In my four-and-a-half inch aneroid, with a three-inch range, divided to 100ths of an inch, the end of the index hand is flattened vertically about $\frac{1}{10}$ of an inch, and by moving the eye till this appears as a line across the graduations of the scale, they can be subdivided with the greatest ease and certainty. In my two-inch aneroid, also, with a three-inch range, divided to 100ths of an inch, the end of the index hand is flattened horizontally, and carries a black line drawn on silver, in the same plane as the graduations of the scale. It is read with a small magnifier, when the graduations may be subdivided with great accuracy. With these instruments I have observed some storms in which the whole change did not amount to the 100th of an inch. When I had discovered these precautions, I was able to draw my pen through a large number of discordant observations. The results are now quite accordant, and in two cases, which I have been able to test with a self-registering mercurial barograph, the results agree perfectly.

There are two classes of storms in this country. In the one the baro-eter rises, in the other it falls. In the case in which it rises the sequence weather is somewhat as follows:—After the sky has become overcast, the ind hushed to an ominous silence, and the clouds seem to have lost their otion, the barometer begins to rise suddenly. In the middle of this rise dden heavy rain begins. After a few minutes the rain, with or without under and wind, becomes a little less heavy, and the barometer sometimes lls a little. The rain then continues till the end of the squall, and as it ops the barometer returns to its original level. In Great Britain the rise rely exceeds 0·1 inch, or lasts more than two hours. These rises are ways superadded to a more general rise or fall of the barometer, due ther to a cyclone, or to one of the small secondary cyclones which are rmed on the side of a greater one. During some rises the wind remains changed; with others, there is a more or less complete rotation of the nd. In all cases the disturbance seems to be confined to the lower strata the atmosphere only. The general features of the rise are the same in a understorm as in a squall, with or without thunder. The thunder, light-ng, rain and weather generally are most violent at the highest part of the se, and the front is always more violent than the rear of a storm.

Associated with thunderstorms on the sea coast, small irregular tidal waves ve often been observed.

The following examples will illustrate the general sequence of squall enomena:—

London, April 27th, 1870.

10·0 and 10.45 a.m. Barometer 30·14 in.
11.0. 30·15 in.; squall coming on from north.
11.5. 30·16 in.; heavy rain.
11.10. 30·17 in.
11.15. 30·17 in.; squall over; cleared first in NW; no veering of the wind.
11.20. 30·17 in.
11.30. 30·165 in.; overcast to NW.
11.40 to 11.50. 30·165 in.
12.0. 30·16 in.
12.10. 30·16 in.; squall approaching.
12.17. A few drops of rain.
12.20. 30·16 in.; squall over.

There was no cirrus formed during this uall. In fig. 1, I have plotted the baro-eter, and underneath the proper times ve drawn lines marked *o*, *r*, to denote spectively overcast or cloudy, and rain. hese lines show in a striking manner the ay in which the rain comes on in the middle the sudden rise, and is preceded by a simply overcast sky. In this case

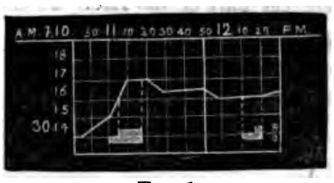


Fig. 1.

the rain ceased before the barometer began to fall. The second squall seems to have been too slight to affect the barometer, which was not so sensitive as some I have used since. Soon after the barometer began to rise.

PETERSHAM, September 10th, 1869.

5.10 a.m. Distant thunder; barometer much down since midnight; wind SE, but clouds from S, like festooned or "pocky" stratus.

5.20. Barometer 29·68 in.

5.30. 29·69 in.; thunderstorm, not very near; heavy rain for a few minutes.

5.40. 29·67 in.; storm past; wind ENE; clouds S.

5.55. Barometer up to 29·72 in.; fresh storm; wind SE; clouds SSW, or S.

5.56. 29·73 in.; heavy rain.

6.0. Continuous distant roar of thunder; rain.

6.5. 29·71 in.

6.15. 29·71 in.; storm almost over.

6.25. 29·68 in.; rain; overcast; wind NE.

By 8 a.m. the barometer was down to 29·62 in.; wind SE; clouds S or SW. Both these storms appeared to pass to the NW.

In fig. 2, I have plotted this storm in the same way as in fig. 1, only that an additional line marked *t* has been added to represent the time of thunder.

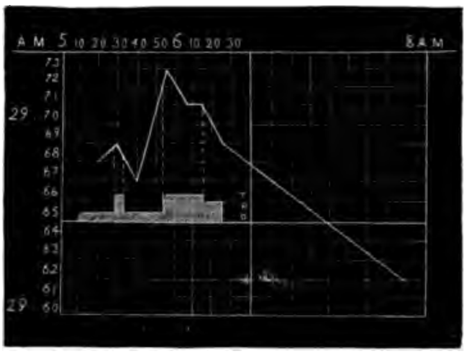


FIG. 2.

In the first storm the interval between observations has been too long to trace it exactly, but the few minutes of rain and thunder belong to the highest part of the rise. In the second storm we find the thunder and rain coming on just before the barometer reaches its highest point, and the heavy rain and continuous thunder occurred under the highest point; while the cessation of thunder is nearly coincident with the fall at 6.15.

The rain and cloud, which continued till the observations ended, are probably due to the cyclone which caused the fall of the barometer before and after the storm. It may be remarked, that in this case the veering of the wind was confined to the surface only.

, I have given the barogram and wind trace at Kew, 2¼ miles etersham, for the same day, September 10th, 1869. This will the rise due to a storm, is to a general fall of the baro- o a cyclone, and the identity its with my own observations ustworthiness of the method

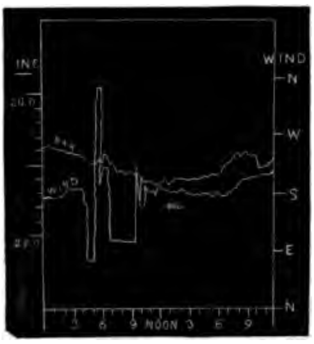


Fig. 3.

ad squalls do not always come off so definitely, and more l barometric changes are ob- t the above seem typical of al character, and in almost a well marked change in the or intensity of the weather is d by a change in the baro-

observed this class of thunderstorms in Southern Germany. A ie Persian Gulf has been recently described before this Society,* e barometer rose 0·2 inch, and a similar one has been described In the tornadoes of the Gold Coast the barometer always rises, es are also affected.

then, that squalls and thunderstorms in which the barometer rises al feature of meteorology, and are perfectly distinct from cyclonic think that as a class we might appropriately call "*squall storms*" ns, with or without thunder, in which the barometer rises, and rotation of the wind; while in an ordinary "*squall*," with or under, the barometer rises, but there is no rotation of the wind. represent the observed features of squall storms, and in conclusion nake a few remarks on their origin and bearing with reference to al principles of meteorology.

in this country squall storms are almost always associated with secondary cyclones, those in India and Africa are not connected ies, and hence the source of the barometric rise cannot be due to phenomenon of cyclone motion.

e rise is always under the visible storm, it is propagated at the and in the same manner as thunderstorms. Enough is known of of the latter to be certain that they are not propagated like waves and hence these small barometric rises are not due to aerial has sometimes been suggested. Since the general character of the same, whether there is thunder or not, it is evident that electricity, at intensity which is discharged disruptively, is not the cause of

ok at a squall from a distance, we always see *cumulus* above it, arder and more intense in the front than in the rear of the squall.

* 'Quarterly Journal of the Meteorological Society,' Vol. I. p. 117.

Since *cumulus* is the condensed summit of an ascensional column of air, it is evident that the barometric rise takes place under an uptake of air. If we consider further, that a light ascensional current would give rise simply to an overcast sky, a stronger one to rain, while a still more violent one would project the air suddenly into a region so cold and dry that the resulting electricity would be discharged disruptively as lightning, the foregoing observations show that the *greatest rise is under the greatest uptake.* Our knowledge of the mechanics of fluid motion is still too unsettled for us to say with certainty whether or not an ascensional current of air would have a reaction backwards, like a jet of air issuing from an orifice.

On this point there is the greatest difference of opinion among meteorologists. Some attribute the low pressure at the Equator to the ascending current formed at the junction of the Trades; while others attribute the 10 a.m. *maximum* of the diurnal range of the barometer to the reaction of an ascending column of air, due to the increasing heat of the day. The above observations tend to strengthen the view that an ascending column of air gives rise to a reactionary pressure downwards, and more generally to the idea that, though the total pressure shown by the barometer is principally statical, or due to the weight of a definite column of air, a small portion is dynamical, or due to the reaction of air motion in that column.

The tidal irregularities associated with thunderstorms are more like earthquake waves than the irregularities associated with ordinary bad weather, in which wind is probably the chief agent. I think that a thunderstorm, say two miles across, and going twenty miles an hour, in which the barometer rose 0·05 inch, could not fail to set up a wave disturbance due to the sudden increase of pressure, in this case equal to about 8¼ lbs. per square foot.

In the 'Philosophical Magazine' of January 1869, there is a paper by Mr. Edmonds on some tidal waves in Mount's Bay. In most cases they were associated with thunderstorms; but in one or two cases where there were no thunderstorms, distant earthquakes were recorded; and from this circumstance Mr. Edmonds concludes that they were all due to earthquakes. It is evident, however, that the phenomenon of a tide wave would be the same, whether it was set up by an earthquake, or by a thunderstorm.

In a letter to 'Nature,' dated August 23rd, 1873, Mr. H. C. Russell, Director of the Sydney Observatory, describes a succession of tidal waves recorded there between the 15th and 18th August. On the 16th there was a thunderstorm, and the barograph showed some peculiar curves, the interval between five of which was almost the same as that between the tidal waves. The largest oscillation of the mercury was 0·045 in., equal to about six inches of water, while the largest tidal wave was five inches. He finds a marked recurrence of tide waves in August for eight years back, and doubts the idea of their having an earthquake origin. I am inclined to think that the waves were set up by the sudden changes of atmospherical pressure, and that their periodicity in August is due to the recurrence of thunderstorms at that season in Eastern Australia.

The class of storms in which the barometer falls I hope to make the subject of a future paper.

DISCUSSION.

Mr. Budd asked if it were not possible for the rain in falling to compress the lower stratum of the air, and thus cause the slight rise in the barometer noticed?

XLV. *Note on Solar Radiation in its relation to Cloud and Vapour.* By J. Park Harrison, M.A., F.M.S.

[Received May 19th. Read June 16th, 1875.]

To test the correctness of the conclusions that Hermann v. Schlagintweit arrived at some years ago in India, regarding the occurrence of maximum *insolation* on days of great relative humidity, I extracted, in 1867, the monthly maxima of Solar Radiation and Vapour Tension for a series of years from the 'Results of the Meteorological Observations' at Greenwich, and found that insolation and humidity reached their maximum at the Royal Observatory at about the same period, in July and August, some time after the summer solstice.

The result was in accordance with the actinometric observations taken by Mr. Nash in 1864. On selecting the means of several groups of readings at or near the same altitude of the sun in the months of March and April in spring, and in the months of August and September in autumn, I found that the values of the scale readings in the latter case were about 100 per cent. greater than in the spring. The mean result in scale divisions in autumn was 39·6, whilst the mean result in spring was 19·4.

Very few of the observations taken in May and July were found to be comparable. But those which most nearly fulfilled the necessary conditions indicated a maximum in July.

Thus, at 0h. 28m. on May 16th, the altitude of the sun being 56°, and the sky *cloudless*, the mean of the scale readings was 21·4; whilst in July, at an altitude of only 50°, with the "sky clear *about the sun*," the mean reached 46·7. Again, on the same day, the mean result of the scale readings was 23·7, at an altitude of the sun of 57°, and 39·3 on July 13th, at an altitude of 58°. On both the latter occasions observations were made under an apparently *cloudless* sky.*

It should be mentioned that the mean tension of vapour, as derived from observations taken at 22h. 0h. and 2h., at the Royal Observatory in 1840-47, is 0·4 in. in May, and 0·5 in. in July; or, more exactly, 0·368 in. and 0·469 in.

The occurrence of the high readings of the solar thermometer in India, at periods and on days of great humidity, was attributed by von Schlagintweit to the supposed property of aqueous vapour to absorb and radiate heat, so as to impede the cooling of the black-bulb thermometer. And in the instructive papers on Solar Radiation by the Rev. F. W. Stow, that accurate

* 'Proceedings of the Royal Society 1867,' p. 358.

observer states that the intensity of the sun's heat in the month of May, as shown by the difference between the maximum of a solar radiation thermometer and the maximum of an ordinary shade thermometer, is due to the dryness of the air in that month, owing to the prevalence of northerly winds. There is, consequently, he concludes, less absorption of the sun's rays by the atmosphere.

Whilst accepting the general results of these observations, there is reason, I think, for doubting whether, in a longer series of years, northerly winds would be found to prevail in May, at any rate in the latter half of the month: and whether the difference between the readings of the self-registering solar and shade thermometers can always be taken as satisfying the requirements of strict scientific experiment. For besides the fact that the readings would not be contemporaneous (the interval between the date of the maximum of the two instruments being often such as would allow of the occurrence of a considerable change in the weather and state of the sky), there appears to be, in addition to this, a source of error of even more importance, viz. that whilst all things might be the same as regards the altitude of the sun, &c. temperature being admittedly lowered by northerly winds, this would affect a thermometer protected by an envelope less than it would one in free air. The difference, then, between the readings of solar and shade thermometers in May or at other seasons would not be attributable to any increase of heat in the solar rays, but to an undue reduction of the temperature of the standard or shade thermometer. In some cases the differences between the readings of the thermometers given in Mr. Stow's second table seem traceable to this cause;* but the direction of the wind, not being given for the station at which the observations were made (Hawsker), had to be derived approximately from the nearest observatories.

The result of some eye observations and experiments of my own, in 1869,† show, I think conclusively, that the "stinging" effect noticed by v. Schlagintweit in India, and not unusual in this country also, is due to the presence of *cirrus* and visible vapour in the neighbourhood of the sun. It is to this cause that I cannot but attribute the abnormal solar radiation which is occasionally registered in the spring and autumn months; and it may account for post-meridian maxima also, light cloud, as is well known, having a tendency to form in the early afternoon, and the solar heat, which would otherwise be dispersed, being thereby deflected in the direction of the black-bulb thermometer, over and above what it receives directly from the sun.

As regards the supposed property of aqueous vapour to absorb heat, it should be remembered that it is not a doctrine that is generally accepted by physicists, and indeed has been apparently disproved by M. Poëy, who made,

* *e. g.*—On May 24th and 29th, see Table 'Quarterly Journal of the Meteorological Society,' Vol. I. p. 144.

† 'Proceedings of the Royal Society 1869,' p. 515.

a short time ago, special experiments with the thermo-electric pile at the Havanna, and satisfied himself that a perfectly transparent atmosphere is without any sensible heat.*

DISCUSSION.

Mr. NASH said, that with regard to the observations referred to by Mr. Harrison, his object had simply been to obtain measures with the actinometer on as many clear days as possible through the year. With reference to the cause of the remarkable differences found between the results of observations in spring and autumn, he was not prepared to offer any certain explanation. He thought it not improbable, however, that these differences might be due in a great measure to the prevalence of entirely different winds at the different seasons, and he recommended this view to Mr. Harrison as worthy of examination.

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

MAY 19th, 1875.

Ordinary Meeting.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

JAMES INNES MACKINTOSH, M.D., 45 Church Gate, Bolton;
WILLIAM MUSGRAVE, 31 Arkwright Street, Bolton;
RICHARD EATON POWER, L.R.C.P., Prince Town, Dartmoor;
JOSEPH EVANS SMITH, M.R.C.S., 28 Oseney Crescent, Camden Road, N.W.; and
JAMES WATKINS, Hurst Bank, Heaton, Bolton,
were balloted for and duly elected Fellows of the Society.

The names of one Candidate for admission into the Society, and of two gentlemen proposed as Honorary Members, were read.

The following papers were then read:—

"Remarks on some practical points connected with the construction of Lightning Conductors." By ROBERT JAMES MANN, M.D., F.R.A.S., President. (p. 417.)

"On certain small oscillations of the Barometer." By the Honourable RALPH ABERCROMBY, F.M.S. (p. 435.)

"Proposed modification of the mechanism at present in use for reading Barometers, so that the third decimal place may be obtained absolutely." By R. E. POWER, L.R.C.P. (p. 437.)

The Meeting was then adjourned.

* "M. Tyndall soutient que l'air peut être chargé de vapeur d'eau vésiculaire ou élastique sans troubler l'azur du ciel, lequel reste parfaitement pur, de sorte qu'une grande transparence pour la lumière serait parfaitement compatible avec une grande opacité pour la chaleur, et la radiation terrestre serait alors interceptée malgré la *transparence* parfaite de l'air. Cependant, dans mes expériences galvanométriques sur la température des hautes régions de l'atmosphère et dans mes études sur la formation des nuages et la polarisation atmosphérique, je suis arrivé à des conclusions entièrement inverses."—'Nouvelle Classification des Nuages,' par André Poëy, 1873, p. 73.

JUNE 16th, 1875.

Ordinary Meeting.

ROBERT JAMES MANN, M.D., F.R.A.S., President, in the Chair.

EDWARD RICE MORGAN, M.R.C.S., Neath, Glamorganshire,
was balloted for and duly elected a Fellow of the Society.

Dr. JULIUS HANN, Adjunct, Hohe Warte, Vienna; and
MONS. EMILIEN RENOU, Secrétaire de la Société Météorologique de France, Parc de St. Maur, Avenue de la Murelle, Paris,
were balloted for and duly elected Honorary Members of the Society.

The name of one Candidate for admission into the Society was read.

The following papers were then read:—

"On a White Rain or Fog Bow." By G. J. SYMONS, F.M S. (p. 438.)

"On a proposed form of Thermograph." By E. O. WILDMAN WHITEHOUSE, F.R.A.S. (p. 445.)

"On the Rainfall at Athens." By Professor V. RAULIN. [Translated from the 'Comptes Rendus,' by R. STRACHAN, F.M.S.] (p. 448.)

"On the Barometric Fluctuations in Squalls and Thunderstorms. By the Honourable RALPH ABERCROMBY, F.M.S. (p. 450.)

"Note on Solar Radiation in its relation to Cloud and Vapour." By J. PARK HARRISON, M.A., F.M.S. (p. 455.)

"Description of Lowe's Graphic Hygrometer." By R. H. SCOTT, F.R.S.

MR. LOWE has fitted a graphical table on the same framework with the two thermometers, which enables the observer to find speedily the quantity he wants.

To find the actual temperature, read the left hand or dry bulb thermometer. To find the sensible temperature, or temperature due to evaporation, read the right hand or wet bulb thermometer.

To find the relative humidity take hold of the knob in front of the instrument, and slide it up or down, as the case may be, until the lower edge of the upper pointer coincides with the auxiliary scale in degrees and fraction of degrees with the observed temperature of the dry bulb thermometer, then by turning the knob by the right or left, bring the upper edge of the lower pointer to coincide in degrees and fraction of degrees, upon the auxiliary scale, with the observed temperature of the wet bulb thermometer.

The instrument is now adjusted, and the *relative humidity*, *dew-point*, and *absolute amount* of moisture will be indicated by the index upon the nearly vertical lines; let the eye follow this line to the top of the dial, and under "*relative humidity*" will be found numbers which give the percentage of humidity sought.

Observe upon the dial the diagonal line upon which the end of the index hand rests; let the eye follow it down to the last vertical line of the dial, and the numbers there indicate the *dew-point sought*.

Upon these lines, also, will be found a number which gives in grains and tenths the weight of water (in form of vapour) in each cubic foot of air, and also another column, giving the force of vapour in inches and tenths.

The Meeting was then adjourned.

Donations received from July 1st to September 30th, 1875.

Presented by Societies, Institutions, &c.

Adelaide	Observatory	Rainfall for April 1875. By C. Todd, F.R.A.S., Director.
Brussels	Observatoire Royal......	Annales, January to April, 1874; June to August, 1875.
Cairo	Société Khédiviale de Géographie	Statuts de la Société Khédiviale de Géographie.
	" "	Discours prononcé au Caire à la Séance d'Inauguration le 2 Juin 1875, par Le Dr. G. Schweinfurth.
Calcutta	St. Xavier's College Observatory	Meteorological Register, January to June. Rev. E. Francotti, S.J., Director.
Copenhagen ..	Danske Meteorologiske Institut	Bulletin Météorologique du Nord, June 1 to August 31.
	" "	Annuaire Météorologique pour l'année 1873. By Captain N. Hoffmeyer, Director.
Cracow	K. K. Sternwarte........	Meteorologische Beobachtungen, June and August. By Dr. F. Karlinski, Director.
Dorpat........	Kaiserliche Universität ..	Meteorologische Beobachtungen angestellt in Dorpat im Jahre 1874. Band ii., Heft iv.
Edinburgh	Scottish Meteorological Society	Journal, Nos. 43-46.
	" "	Address on Ozone, by Thomas Andrews, LL.D., F.R.S.
Fiume	I. R. Accademia di Marina	Meteorological Observations, April to August.
Geneva	Société de Géographie ..	Le Globe, Tome xiii., Livraisons 1-4.
Greenwich .. .	Royal Observatory	Papers on Meteorology relating especially to the climate of Britain, and to the variations of the Barometer, communicated to the Royal Society at various Periods from 1821 to 1845. By Luke Howard, F.R.S.; being Part ii. of the Appendix to Barometrographia.
	" "	Observations in Magnetism and Meteorology made at Makerstoun, in Scotland, in the Observatory of General Sir T. M. Brisbane, Bart., in 1844, 1845 and 1846. Discussed and edited by J. Allan Broun, Director of the Observatory.
	" "	Weather Book. Instructions.
	" "	" Register.
	" "	A collection of Tables, Astronomical, Meteorological and Magnetical; also for determining the Altitude of Mountains, comparison of French and English Weights and Measures, &c. Computed in the Office of the H. E. I. Co.'s Magnetic Observatory, Simla, under the direction of Lieut-Col. J. T. Boileau, Superintendent.
	" "	Meteorological Register kept at the Honourable the East India Company's Observatory at Madras, by John Goldingham, F.R.S., and Thomas Glenville Taylor, F.R.S., for the years 1822-1843.

Greenwich	Royal Observatory	Meteorological Observations made at the Honourable East India Company's Magnetical Observatory at Singapore. By Captain C. M. Elliott, of the Madras Engineers, in the years 1841-1845.
	" "	Results of the Magnetical, Nautical and Meteorological Observations made and collected at the Flagstaff Observatory, Melbourne; and at various stations in the Colony of Victoria, March 1858 to February 1859.
	" "	Magnetical and Meteorological Observations made at Washington, under orders of the Hon. Secretary of the Navy, dated August 13th, 1838. By Lieutenant M. Gilliss, U. S. N. 1838-1842.
	" "	Tables Barométriques pour faciliter le calcul des nivellements et des Mesures des Hauteurs par le Baromètre, par Bernard de Lindenau.
	" "	Annali del Reale Osservatorio Meteorologico Vesuviano, compilati da Luigi Palmieri. Nuova Série, Anno Primo.
	" "	Publicationen der Hamburger Sternwarte No. 1. Herausgegeben von Director Georg Rümker.
	" "	Meteorologische Beobachtungen Aufgezeichnet auf Christiania's Observatorium. Erste Lieferung 1837-1841. By Sir G. B. Airy, K.C.B., Astronomer Royal.
London........	General Register Office ..	Weekly Returns of Births and Deaths, Nos. 25-38.
	" "	Quarterly Return of Marriages, Births and Deaths, June 30. By the Registrar-General.
	Meteorological Office	Daily Weather Report and Charts.
	" "	Quarterly Weather Report; Part iv., 1873; and Part i., 1874.
	" "	Hourly Readings from the Self-recording Instruments at the Seven Observatories in connection with the Meteorological Office, January to April.
	" "	Report of the Meteorological Committee of the Royal Society for the year ending 31st December, 1874.
	" "	Instructions in the use of Meteorological Instruments. Compiled, by direction of the Meteorological Committee, by Robert H. Scott, M.A., F.R.S.
	" "	Weekly Abstracts of Observations and Results made at the Southport Meteorological Observatory, August 18th, 1871, to March 26th, 1875.
	" "	Results of Rainfall Observations to the end of the year 1874, made at the Southport Meteorological Observatory.
	" "	Velocity of the Wind at Southport and Eccles, near Manchester. By the Meteorological Committee.
	Royal Society	Proceedings, No. 162.
Melbourne	Observatory	Monthly Record of Results of Observations in Meteorology, Terrestrial Magnetism, &c. November 1874 to January 1875. By R. J. Ellery, F.R.S., Government Astronomer.
Milan	R. Specola Astronomica di Brera	Riassunti Mensili dell'Osservazioni Meteorologiche fatte nell' anno, 1874.

Milan	R. Specola Astronomica di Brera	Osservazioni Meteorologiche, January to May.
	" "	Resoconto delle Operazioni fatte à Milano nel 1870 in Corrispondenza cogli astronomi della commissione Geodetica Svizzera per determinare la differenza di longitudine dell' Osservatorio di Brera coll' Osservatorio di Neuchatel e colla Stazione Trigonometrica del Simpione, per G. V. Schiaparelli e G. Celoria.
	" "	Osservazioni Astronomiche diverse fatte nella Specola di Milano da Guglielmo Tempel (1871-1874).
	" "	Le Sfere omocentriche di Eudosso, di Calippo e di Aristotele. Memoria di G. V. Schiaparelli.
Moncalieri	Osservatorio del R. Collegio Carlo Alberto....	Bullettino Meteorologico. Vol. ix., Nos. 8 and 9. By Padre F. Denza, Director.
Paris..........	Observatoire de Montsouris	Bulletin Mensuel, Nos. 42 and 43. By M. Marié Davy, Director.
	Observatoire National ..	Bulletin International. By M. U. J. Le Verrier, Director.
	Société Météorologique de France	Nouvelles Météorologiques, June to August.
	" "	Annuaire. Tome xxii. 1874. Bulletin des Séances. Feuilles 10-15.
	" "	Ditto. Tableaux Météorologiques. Feuilles 5-9.
Philadelphia ..	American Philosophical Society	Proceedings, No. 93.
Prague	K. K. Sternwarte	Astronomische, Magnetische und Meteorologische Beobachtungen, 1874. By Dr. C. Hornstein, Director.
Rome	Osservatorio del Collegio Romano	Bullettino Meteorologico, Vols. ii.; iii., Nos. 2, 3; v.—xiii ; xiv., No. 5. By Padre A. Secchi, Director.
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Presented by Individuals.

Baker, J. G., F.L.S.......	Elementary Lessons in Botanical Geography. By J. G. Baker, F.L.S.
Clift, H. A.	The Weather at Harbour Grace, Newfoundland, June to August (MS.).
Crookes, W., F.R.S.....	The Electrical News and Telegraphic Reporter, Nos. 1-13.
Delaney, John	General Meteorological Register for the year 1874, St. John's, Newfoundland.
Dunlop, W. H.	Results of Meteorological Observations made at Annanhill, Kilmarnock, Ayr, May to August.
"	Weather Statistics during the Smallpox Epidemic in Kilmarnock of 1873-1874. Compiled from the Meteorological Register kept at Annanhill, by W. H. Dunlop.
Fritsch, K.	Normale Zeiten für den Zug der Vögel und Verwandte Erscheinungen von Karl Fritsch.
"	Jährliche Periode der Insectenfauna von Oesterreich-Ungarn. I., die Fliegen (Diptera) von Karl Fritsch.
Hankinson, R. C.	Summary of Meteorological Observations taken at Red Lodge, Southampton, June (MS.).
Hann, Dr. J.	Untersuchungen über die Veränderlichkeit der Tages-temperatur, von Dr. J. Hann.
Higgs, Rev. W., LL.D. .	The Telegraphic Journal and Electrical Review, Nos. 59-63.
Hoskins, S. E., M.D., F.R.S.	Meteorological Observations taken at Guernsey, June to August.
Langlois, P., M.R.C.S. ..	Diagram of the results of ten years' observations taken at Millbrook, Jersey, from January 1st, 1865, to December 31st, 1874 (MS.).
Loomis, Prof. E.	Results derived from an Examination of the United States Weather Maps for 1872, 1873 and 1874. By Elias Loomis.
MacGregor, W.	Protection of Life and Property from Lightning during Thunderstorms. Written and compiled by W. MacGregor.
Marriott, W.	Weekly Return of Births and Deaths. Nos. 2-31, 33-38, 1873.

Melsens, M.	Troisième Note sur les Paratonnerres, par M. Melsens.
Michel, R. F.	Resumé des expériences faits à l'Administration des Lignes Télégraphiques sur les parafoudres télégraphiques.
"	Analyse des Rapports des Architects sur l'Etat de Paratonnerres surmontant les Edifices Municipaux.
"	Analyse des Rapports de M. de Fonvielle, à la suite de la mission qui lui avait été confiée en 1872, par M. Jules Simon, pour faire en Angleterre une enquête sur la foudre et leur Paratonnerres.
"	Instruction de la Commission chargée d'étudier l'établissement des paratonnerres des Edifices Municipaux de Paris, adoptée dans la Séance du 20 Mai. 1875.
Miller, S. H., F.R.A.S. ..	The Fenland Meteorological Circular and Weather Report, July to September.
Munn, A.	Abstract of Meteorological Observations for 1874, Harbour Grace (MS.).
"	Observations taken with Dr. Schönbein's Ozonometer, at Harbour Grace, Newfoundland, from January 1st to March 31st (MS.).
Quetelet, E.	Sur la Direction de l'Aiguille aimantée à Bruxelles, en 1875. Note par M. Ernest Quetelet.
Silver, S. W.	The Colonies, Nos. 190-195.
Symons, G. J.	Symons's Monthly Meteorological Magazine, July to September.
The Editor..............	Nature, Nos. 296-308.
"	The Academy, Nos. 165-177.
Turtle, Lancelot	The Weather at Aghalee, Lurgan, June to August.
Van Rysselberghe, Prof. F.	Courbes Météorographiques gravées à Ostende par L'Enregistreur Universel de Van Rysselberghe, June 10th-14th.

INDEX.

THE END.

Printed by WILLIAMS and STRAHAN, 7 Lawrence Lane, Cheapside, E.C.

ETEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING MARCH 31, 1872.

KS ON THE WEATHER DURING THE QUARTER ENDING MARCH 31ST, 1872.

'y JAMES GLAISHER, ESQ., F.R.S., *&c.*, *Secretary of The Meteorological Society.*

m weather which set in on December 13th, 1871, following that period of unprecedented ended on the preceding day, continued with very few and very slight exceptions till the f March. The mean temperatures of the 97 days ending on this day were more than 5° bove their averages; the direction of the wind during this time was mostly from the : was followed by eight days of severe cold weather, their average daily deficiency was rection of the wind was mostly from the North, and snow fell over the country, even to Coast, and over the counties of Devonshire and Cornwall. This cold period was very t, owing to its suddenness and great contrast to the long continued high temperature of the)7 days. The mean temperature of the 17th day of March was 9¼° in excess above , whilst that of the 21st was as much as 12° in defect below its average, and therefore ay was 21¼° of lower mean temperature than the former. The remaining five days of were warm. I do not know any instance of so remarkable a cold period as that ending 12th, 1871, being followed by as remarkable a warm one as that ending March 18th, 1872.

n temperature of January was 41°·3; since the year 1771 there have been nine Januaries ıt higher temperature, viz.,—

ear 1796 was 45°·3.	The year 1846 was 43°·7.	The year 1853 was 42°·4.
1804 „ 43°·2.	„ 1851 „ 42°·9.	„ 1863 „ 41°·8.
1834 „ 44°·4.	„ 1852 „ 42°·0.	„ 1866 „ 42°·6.

ın *temperature* of February was 44°·8; the instances back to 1771, in which the mean e of February has exceeded 44°, are as follows:—

ear 1779 was 45°·3.	The year 1809 was 44°·1.	The year 1867 was 44°·7.
1792 „ 44°·7.	„ 1850 „ 44°·7.	„ 1869 „ 45°·3.

n two instances only, viz., in the years 1779 and 1869, has the month of February been ın in this year.

temperature of March was 44°·6; since the year 1771 the value has been exceeded viz., in the following years:—

ear 1779 was 47°·0.	The year 1822 was 47°·3.	The year 1842 was 44°·9.
1780 „ 49°·2.	„ 1830 „ 45°·8.	„ 1859 „ 46°·4.
1815 „ 45°·0.	„ 1841 „ 46°·2.	„ 1871 „ 44°·9.

n temperature of January and February was 43°·05; the mean of these two months in

ear 1796 was 42°·45.	The year 1849 was 41°·65.	The year 1863 was 41°·95.
1834 „ 42°·30.	„ 1851 „ 41°·50.	„ 1866 „ 41°·55.
1846 „ 43°·80.	„ 1859 „ 41°·75.	„ 1869 „ 43°·20.

the mean temperature of January and February 1872 has been but twice exceeded in s 100 years, viz., in 1846 and 1869.

n of the three months ending March 1872 is 43°·6, the corresponding mean for the same

ear 1779 was 42°·4.	The year 1834 was 42°·9.	The year 1851 was 41°·9.
1819 „ 41°·4.	„ 1846 „ 43°·6.	„ 1859 „ 43°·3.
1822 „ 43°·5.	„ 1849 „ 41·9.	„ 1863 „ 42°·6.

ack for 100 years the warmth of the past three months has been but once equalled, viz., r 1846, and has never been exceeded; in two instances there have been closely e values, viz., in the years 1822 and 1859.

age temperature of the first three months in the year, as found from the previous 100 °·6, and as found from the preceding 31 years is 39°·6; the excess of temperature for the r the longer average is therefore 5°, and over that of 31 years is 4°.

thened period of 97 days of warm weather has, however, been exceeded in a few instances. r 1821 a warm period set in at the end of October, and continued till the end of

a warm period began on October 21st, and continued to March 16th, 1834.

a warm period set in on December 18th, and extended to April 11th, 1859.

a warm period commenced at the beginning of December, and continued to the end of following.

temperature of the *five* months ending March 1822 was 44°·6; that ending March 1834 whilst that ending March 1872, owing to the severity of the cold in November and was 41°·3 only.

temperature of the four months ending March was—

43°·8 in the year 1822.	42°·8 in the year 1863.
43°·3 „ 1834.	42°·2 „ 1872.
42°·7 „ 1859.	

, remarkable as the quarter has been for its long continued high temperature, there are es of a more lengthened period, two of which, viz., in 1821–1822 and 1833–1834, were re months continuance at this season of the year.

arkable fact of this winter is the long continuance of high temperature, following so remarkable a long continuance of weather of low temperature.

temperature of the quarter was general; taking the whole country, its mean temperature exceeding that in 1869 by 1°·4, that in 1870 by 4¾°, and that in 1871 by 3¼°.

of rain in February was only one half of its average, but in January and March it was *both months.* The average fall over the country in this quarter exceeded that in the *g quarter in 1869* by 2¼ inches, in 1870 by 4 inches, and in 1871 by 4½ inches. The *ures of the atmosphere* were in defect in each month of the quarter.

On the 1st January the reading of the barometer at the height of 159 feet above sea level was 29·9 in. A decrease set in on this day and lasted till 9h. a.m. on the 5th, the value at that time being 28·87 in.; the mean reading for the 5th was eight-tenths of an inch below the average for that day. From the 6th to the 13th the movements were numerous, rise and fall following each other in rapid succession, but on the 14th an increase to 29·9 in. occurred, followed by a steady decrease to 28·9 in. on the 18th. From this day till the end of the month the mean daily values were with one exception below the average, on occasions the departures were large, notably so on the 13th and 24th, when the amounts were 1 in. and 1·1 in. respectively. The minimum value on the 24th, 28·21 in., is lower than any since 1843, Jan. 13, when it was 28·096 in., and on 1821, Dec. 24, the minimum reading as recorded at the Royal Observatory, Greenwich, was 27·89 in. Some other instances of low readings are:—1783, March 6, 28·22 in.; 1809, Dec. 17, 28·20 in., and 1824, Nov. 23, 28·37 in. Two series of meteorological observations are preserved in the Manuscript Room of the Royal Observatory, the one taken at Sion House in Middlesex, the other at Gordon Castle, near Edinburgh. The instances in those journals in which the reading of the barometer has been below 28·3 in., are the following:—

At Sion House, 1791, Jan. 20, 28·10 in.	At Gordon Castle, 1782, Jan. 3, 28·27 in.
	„ 1789, Jan. 18, 28·08 „
„ 1809, Dec. 18, 28·30 „	„ 1791, Jan. 4, 28·22 „
	„ 1791, Jan. 17, 28·24 „
„ 1821, Dec. 25, 28·20 „	„ 1796, Jan. 22, 28·23 „
	„ 1798, Nov. 27, 28·23 „
	„ 1805, Dec. 21, 28·23 „

The absolute range of readings in January 1872 was 1·8 in.

During February the changes of reading were small throughout, the absolute range in the month being but seven-tenths of an inch; the mean daily values were generally in defect of the average, the greatest departure being 0·46 in.

The principal movements during March were:—An increase to 30·4 in. on the 3d, a decrease to 29·2 in. on the 7th, an increase to 30·2 in. on the 10th, and a gradual decrease, though interrupted frequently by small oscillations, to 29·1 in. on the 30th. The range of reading during March amounted to one inch.

The mean temperature of January was 41°·3, being 5° higher than the average of 101 years, higher than the corresponding values in the years 1867–1871, but lower than in 1866 when 42°·6 was recorded.

The mean temperature of February was 44°·8, being 6°·3 higher than the average of 101 years, higher than in the corresponding months of 1871 and 1870, but lower than in 1869, the value in that year being 45°·3. There is no other instance in the period 1771–1871 when this value has been exceeded, but in the years 1867, 1850, and 1794, when 44°·7 was registered in each of those years.

The mean temperature of March was 44°·6, being 3°·7 higher than the average of 101 years. In 1871 the corresponding temperature was 44°·9, but no other instance of higher mean temperatures in March is recorded till as far back as 1859.

The mean high day temperatures of January, February, and March were higher than their respective averages by 3°·3, 6°·2, and 3°·9.

The mean low night temperatures of January, February, and March were higher than their averages by 3°·6, 5°·1, and 2°·6 respectively.

Therefore the days and nights in each of the three months were remarkably warm.

1872. Months.	Temperature of Air. Mean.	Air. Diff. from average of 101 years.	Air. Diff. from average of 31 years.	Evaporation. Mean.	Evaporation. Diff. from average of 31 years.	Dew Point. Mean.	Dew Point. Diff. from average of 31 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 31 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 31 years.	Weight of vapour in a Cubic Foot of Air. Mean.	Weight of vapour. Diff. from average of 31 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
Jan. -	41·3	+5·0	+3·3	39·9	+2·2	38·1	+3·4	9·3	−0·3	40·1	0·230	+0·029	2·7	+0·4
Feb. -	44·8	+6·3	+5·5	42·9	+5·3	40·7	+5·7	12·5	+1·1	44·2	0·254	+0·048	2·9	+0·5
Mar. -	44·6	+3·7	+3·1	42·4	+3·2	39·8	+3·6	15·8	+1·2	46·5	0·245	+0·030	2·8	+0·3
Mean -	43·6	+5·0	+4·0	41·7	+3·6	39·5	+4·2	12·5	+0·7	43·6	0·243	+0·036	2·8	+0·4

1872. Months.	Degree of Humidity. Mean.	Degree of Humidity. Diff. from average of 31 years.	Reading of Barometer. Mean.	Reading of Barometer. Diff. from average of 31 years.	Weight of a Cubic Foot of Air. Mean.	Weight of a Cubic Foot of Air. Diff. from average of 31 years.	Rain. Amount.	Rain. Diff. from average of 57 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
Jan. -	89	+ 1	29·463	−0·286	545	− 9	3·6	+1·7	325	11	19	1	20·1	40·2
Feb. -	86	+ 1	29·645	−0·152	544	− 9	0·8	−0·8	302	6	21	2	24·2	42·4
Mar. -	84	+ 2	29·625	−0·125	544	− 6	2·1	+0·5	276	14	11	6	19·9	46·7
Mean -	86	+ 1	29·578	−0·188	544	− 8	Sum 6·5	Sum +1·4	Mean 301	Sum 31	Sum 51	Sum 9	Lowest 19·9	Highest 46·7

Note.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the *plus sign* (+) signifies above the average.

The daily ranges of temperature were greater than their averages in February and March, but less in January.

The fall of rain was 1·7 in. and 0·5 in. respectively in excess of the average in January and March, but 0·8 in. in defect in February.

The mean temperature of the air in the three months ending February, constituting the three winter months, was 41°·5, being 3°·5 higher than the average of 101 years.

Thunderstorms occurred on the 2d of January at Guernsey; on the 3d at Eccles; on the 4th at Llandudno and Halifax; on the 5th at Guernsey, Osborne, Bournemouth, Portsmouth, Taunton, Leamington, and Oxford; on the 6th at Norwich and Llandudno; on the 8th at Helston and Llandudno; on the 22d at Guernsey; on the 23d at Osborne; and on the 24th at Salisbury. On the 23d of February at Wisbech. On the 1st of March at Holkham; on the 22d at Somerleyton Rectory; on the 24th at Eastbourne; and on the 30th at Stonyhurst and Hawarden.

Thunder was heard, but lightning was not seen, on the 3d of January at Stonyhurst; on the 24th at Truro; and on the 27th at Halifax. On the 23d of February at London and Holkham; and on the 28th at Holkham. On the 8th of March at Allenheads; and on the 21st at Aldershot.

Lightning was seen, but thunder was not heard, on the 2d of January at Oxford; on the 3d at Taunton; on the 4th at Helston and Strathfield Turgiss; on the 5th at Brighton, Strathfield Turgiss, and Cardington; on the 6th at Stonyhurst and Carlisle; and on the 8th at Liverpool. On the 14th of February at Portsmouth and Wilton House; on the 22d at Somerleyton; and on the 23d at Marylebone and Somerleyton. On the 28th of March at Halifax; and on the 30th at Strathfield Turgiss, Cardington, and Halifax.

Solar halos were seen on 13 days during the quarter.

Lunar halos were seen at different places on eight occasions in January, six in February, and eight in March.

Auroræ Boreales were seen on the 2d of February at Weybridge; on the 3d at Sidmouth and Brighton; on the 4th all over the country; on the 5th at Brighton; on the 6th at Brighton; on the 11th at Brighton; and on the 23d at Culloden. On the 19th of March at Halifax; and on the 20th at Norwich.

Snow fell in small quantities occasionally in January and February at northern and elevated stations, and from March 20th to the 26th all over the country.

Hail fell on 33 different days, during the quarter.

Fog was prevalent at one or other place on 19 days in January; on 20 in February; and on 13 in March.

Leaf Buds first appeared on the Field Elm on the 28th of February at Chislehurst; on the 3d of March at Strathfield Turgiss and Weybridge Heath; and on the 26th at Carlisle.

Leaf Buds first appeared on the Wych Elm on the 30th of January at Chislehurst.

Leaf Buds first appeared on the Oak on the 24th of March at Weybridge Heath.

Leaf Buds first appeared on the Lime on the 28th of January at Chislehurst. On the 10th of March at Weybridge Heath; on the 20th at Strathfield Turgiss; and on the 31st at Carlisle.

Leaf Buds first appeared on the Sycamore on the 4th of March at Brighton; on the 5th at Weybridge Heath; and on the 12th at Strathfield Turgiss.

Leaf Buds first appeared on the Horse Chestnut on the 28th of March at Carlisle.

Leaf Buds first appeared on the Common Poplar on the 25th of March at Carlisle.

Leaf Buds first appeared on the Hawthorn on the 30th of January at Chislehurst; on the 31st at Eastbourne. On the 12th of February at Weybridge Heath. On the 6th of March at Brighton; on the 15th at Carlisle.

Leaf Buds first appeared on the Hazel on the 1st of March at Strathfield Turgiss.

Leaf Buds first appeared on the Walnut on the 29th of March at Weybridge Heath.

Field Elm in leaf on the 7th of March at Oxford.

Lime in leaf on the 28th of March at Oxford.

Sycamore in leaf on the 19th of March at Helston.

Horse Chestnut in leaf on the 1st of March at Guernsey, on the 7th at Weybridge Heath; on the 13th at Strathfield Turgiss; on the 16th at Helston; on the 27th at Llandudno; on the 28th at Oxford and Culloden; on the 29th at Sidmouth; and on the 30th at Somerleyton Rectory.

Common Poplar in leaf on the 8th of March at Brighton.

Hawthorn in leaf on the 3d of March at Oxford; on the 10th at Guernsey; on the 17th at Brighton; on the 29th at Llandudno; and on the 31st at Osborne.

Hazel in leaf on the 29th of February at Eastbourne.

Rose Bushes in leaf on the 14th of February at Brighton.

Lilac in leaf on the 18th of March at Brighton.

Elder in leaf on the 11th of February at Brighton; and on the 13th at Strathfield Turgiss.

Lilac in blossom on the 12th of January at Strathfield Turgiss; on the 18th at Chislehurst.

Honeysuckle in blossom on the 18th of January at Chislehurst.

Yellow Broom in blossom on the 7th of March at Llandudno.

Primrose in blossom on the 30th of January at Eastbourne.

The Red Flowering Currant in blossom on the 8th of February at Brighton; and on the 26th at Culloden.

Hardy Pear in blossom on the 9th of March at Llandudno; on the 11th at Helston; on the 20th at Chislehurst; on the 24th at Carlisle; on the 26th at Weybridge; on the 28th at Oxford and Culloden; on the 29th at Eastbourne; on the 30th at London; on the 31st at Strathfield Turgiss.

Hardy Apple in blossom on the 20th of March at Helston; on the 30th at Oxford; on the 31st at Eastbourne.

Cherry in blossom on the 14th of March at Brighton; on the 22d at Oxford; and on the 31st at Carlisle.

Plum in blossom on the 7th of March at Strathfield Turgiss; on the 12th at Helston; on the 13th at Oxford; on the 24th at Weybridge Heath; on the 28th at Culloden; and on the 31st at Carlisle.

Rooks began to build on the 22d of March at Brighton.

A 2

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING MARCH 31st, 1872.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1872. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean. Of all Highest.	Mean. Of all Lowest.	Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S.	204	Jan.	29·442	1·820	53·0	37·5	15·5	48·4	41·5	6·9	44·9	40·6	·253	2·9	0·5	86	540	—	—	1·7	3	5	12	11	4·7	6·3	23	6·11
		Feb.	29·578	0·656	54·0	38·5	15·5	49·6	43·2	6·4	46·3	41·7	·265	3·1	0·5	84	541	—	—	1·3	2	7	12	8	3·4	6·2	18	2·97
		Mar.	29·583	1·048	57·5	31·5	26·0	51·0	42·8	8·2	46·2	43·7	·285	3·3	0·4	92	541	—	—	1·3	5	8	9	9	4·1	5·0	17	4·42
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	106	Jan.	29·568	1·449	58·0	30·0	28·0	52·6	42·3	10·3	47·7	41·3	·260	3·2	0·7	81	538	58·1	39·0	2·3	5	2	10	14	6·1	7·2	26	7·03
		Feb.	29·685	0·780	58·0	36·0	22·0	54·2	44·9	9·3	49·4	43·2	·279	3·4	0·8	79	540	64·5	39·6	2·3	4	5	13	7	5·2	7·0	27	6·25
		Mar.	29·742	1·189	64·0	30·0	34·0	55·8	44·3	11·5	49·3	42·0	·268	3·0	1·0	75	541	74·4	37·1	2·1	7	6	9	9	5·2	4·9	18	3·70
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	Jan.	29·574	1·439	54·0	25·0	29·0	50·5	40·2	10·3	45·1	41·0	·256	2·9	0·5	86	543	—	—	2·9	5	2	10	14	—	7·4	28	8·13
		Feb.	29·646	0·791	58·0	34·0	24·0	52·6	42·2	10·4	46·8	43·4	·282	3·2	0·4	88	542	—	—	2·6	3	6	11	9	—	7·6	26	6·98
		Mar.	29·685	1·157	58·0	26·0	32·0	53·0	42·0	11·0	46·4	40·9	·257	2·9	0·7	83	544	—	—	2·8	7	7	8	9	—	6·8	20	3·98
SIDMOUTH (Devon), J. Ingleby Mackenzie, Esq., M.B., F.M.S.	30	Jan.	29·586	1·692	53·3	30·0	23·3	48·0	37·7	10·3	43·2	39·9	·247	2·8	0·4	88	545	—	—	1·4	5	0	9	17	—	4·6	30	5·21
		Feb.	29·765	0·691	53·3	31·3	22·0	50·2	42·7	7·5	46·3	44·2	·290	3·3	0·3	93	544	—	—	1·1	2	5	10	12	—	4·6	20	3·42
		Mar.	29·758	1·099	57·1	26·3	30·8	50·2	40·4	9·8	44·9	42·9	·266	3·2	0·2	93	546	—	—	1·3	7	5	8	11	—	3·6	18	2·67
EASTBOURNE (Sussex), Miss W. L. Hall.	12	Jan.	29·662	1·429	51·4	28·4	23·0	46·8	37·5	9·3	42·8	39·5	·243	2·8	0·4	88	547	55·2	31·8	0·8	5	2	12	12	5·8	—	25	5·73
		Feb.	29·847	0·632	54·0	33·0	21·0	49·9	41·2	8·7	46·0	42·1	·269	3·2	0·4	87	546	73·8	36·4	0·5	1	5	15	8	6·5	—	21	2·57
		Mar.	29·817	1·024	66·1	26·8	39·3	54·5	39·3	15·2	46·2	42·8	·276	3·2	0·6	89	546	94·1	33·5	0·6	5	6	12	8	4·4	—	19	2·78
OSBORNE (Isle of Wight), J. R. Mann, Esq.	172	Jan.	29·456	1·448	53·7	26·6	27·1	47·5	36·0	11·5	41·6	39·4	·242	2·8	0·2	93	544	51·6	33·3	0·2	3	3	16	9	—	7·1	22	5·68
		Feb.	29·632	0·678	56·0	33·5	22·5	51·2	40·4	10·8	45·6	43·0	·280	3·2	0·4	93	543	67·0	37·9	0·1	3	4	16	6	—	8·1	17	2·28
		Mar.	29·628	1·044	59·7	22·3	37·4	52·7	38·7	14·0	44·8	42·0	·267	3·1	0·3	90	544	77·8	36·3	0·3	6	5	12	8	—	6·0	18	2·68
BOURNEMOUTH (Hants), T. A. Compton, Esq., M.D., B.A., F.M.S.	128	Jan.	29·610	1·940	51·2	27·2	24·0	46·7	38·5	8·2	42·5	38·7	·238	2·8	0·5	87	548	—	—	—	6	3	8	14	—	5·1	23	6·87
		Feb.	29·780	0·670	53·2	35·2	18·0	49·4	42·4	7·0	45·7	43·8	·286	3·2	0·3	93	546	—	—	—	4	5	12	8	—	6·4	22	2·74
		Mar.	29·795	1·010	57·5	27·6	29·9	50·1	40·4	9·7	44·6	40·9	·257	2·9	0·4	86	547	—	—	—	9	5	10	7	—	4·5	16	3·06
PORTSMOUTH, William C. Ellis, Esq., F.M.S.	16	Jan.	29·657	1·455	59·4	27·4	32·0	48·6	35·1	13·5	42·3	38·4	·233	2·7	0·5	86	547	60·3	30·4	1·3	4	1	18	8	2·3	7·3	22	5·43
		Feb.	29·823	0·674	55·4	32·8	22·6	50·8	39·0	11·8	45·2	41·8	·264	3·0	0·5	88	547	67·0	35·2	1·3	2	7	15	5	1·9	7·9	15	1·66
WORTHING (Sussex), W. J. Harris, Esq. M.R.C.S.E., L.S.A.	31	Jan.	29·610	1·786	51·2	29·5	21·7	47·0	38·0	9·0	42·5	39·6	·244	2·8	0·3	90	546	76·9	33·8	1·2	4	2	13	12	6·4	7·0	23	5·05
		Feb.	29·780	0·678	54·8	34·4	20·4	49·9	42·3	7·6	45·4	43·0	·276	3·1	0·4	91	546	89·2	37·9	1·0	3	5	14	7	7·0	7·2	19	2·07
		Mar.	29·768	1·063	58·3	27·9	30·4	51·3	40·9	10·4	45·0	40·8	·254	3·0	0·4	87	546	105·1	35·8	1·0	7	5	11	8	5·8	5·4	16	2·19
BRIGHTON (Sussex), Frederick E. Sawyer, Esq., F.M.S.	200	Jan.	29·445	1·695	49·6	30·3	19·3	45·5	38·2	7·3	41·9	39·8	·246	2·9	0·2	94	544	70·5	31·8	1·4	4	3	14	10	1·0	7·3	23	5·19
		Feb.	29·620	0·750	51·9	35·0	16·9	48·8	41·4	7·4	44·7	43·2	·279	3·2	0·1	94	544	80·8	36·2	0·8	4	6	15	4	0·9	7·4	20	2·62
		Mar.	29·599	1·011	57·4	28·4	29·0	49·9	40·3	9·6	44·2	41·6	·263	3·0	0·3	91	544	94·1	35·9	0·9	6	6	11	8	0·9	6·3	17	2·16
LYMINGTON (Hants), George J. Jones, Esq.	77	Jan.	29·563	1·454	51·9	26·9	25·0	47·6	38·5	9·1	42·5	40·5	·252	2·9	0·2	93	545	—	—	0·8	3	4	12	12	—	6·2	22	5·83
		Feb.	29·722	0·632	53·7	33·1	20·6	50·5	41·8	8·7	45·6	42·5	·277	3·1	0·4	94	545	—	—	0·8	2	4	12	11	—	7·5	21	2·28
		Mar.	29·732	0·988	57·9	24·5	33·4	51·9	39·4	12·5	45·6	41·7	·265	3·0	0·5	88	545	—	—	0·2	7	6	10	8	—	5·8	14	2·52

	feet		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
BARNSTAPLE (Devon), T. Mackrell, Esq.	43	Jan.	29·528	1·456	54·0	30·0	24·0	48·8	39·4	9·4	44·4	42·0	·267	3·0	0·3	92	542	–	–	1·3	2	5	15	9	–	4·3	28	6·59
		Feb.	29·698	0·730	56·5	38·0	18·5	51·7	42·4	9·3	48·4	41·7	·264	3·0	0·8	78	542	–	–	1·1	1	3	16	9	–	4·7	24	4·64
		Mar.	29·720	1·180	61·0	29·0	32·0	53·3	42·0	11·3	47·0	41·7	·264	3·0	0·7	83	543	–	–	1·2	6	6	13	6	–	4·5	20	3·74
ALDERSHOT CAMP (Hants), John Arnold, M.S.C., F.M.S.	197	Jan.	29·301	1·560	54·4	28·8	25·6	46·1	34·8	11·3	40·2	37·1	·224	2·6	0·5	90	543	61·4	31·3	1·8	2	5	15	9	2·8	7·8	27	5·95
		Feb.	29·445	0·648	55·0	33·8	21·2	51·2	39·1	12·1	44·2	41·6	·263	3·0	0·3	91	541	76·2	35·6	1·4	3	6	13	7	2·4	8·1	20	2·25
		Mar.	29·440	0·974	60·6	24·8	35·8	53·2	37·7	15·5	44·3	39·7	·245	2·8	0·5	83	541	85·6	34·3	1·3	5	5	10	11	2·1	6·8	14	2·35
STRATHFIELD TURGISS (Hants), Rev. C. H. Griffith, M.A., F.M.S.	197	Jan.	29·422	1·474	53·7	21·8	31·9	45·7	34·0	11·7	40·2	36·8	·218	2·5	0·4	88	545	69·2	28·8	0·9	4	4	12	11	4·6	7·0	23	3·49
		Feb.	29·602	0·677	56·3	31·3	25·0	50·3	38·3	12·0	44·5	42·0	·264	3·0	0·3	90	544	83·0	33·4	0·9	3	6	13	7	5·0	7·5	19	1·67
		Mar.	29·594	1·040	61·2	21·8	39·4	53·4	37·3	16·1	45·5	37·7	·226	2·6	0·3	75	543	95·3	31·3	1·0	5	6	11	9	5·5	6·6	13	1·79
WEYBRIDGE HEATH (Surrey), William F. Harrison, Esq., F.M.S.	150	Jan.	29·492	1·401	53·5	27·5	26·0	46·0	36·2	9·8	40·9	38·4	·233	2·7	0·2	91	546	58·4	33·4	0·9	5	4	16	6	1·7	6·9	23	4·01
		Feb.	29·685	0·724	57·0	32·8	24·2	51·4	38·8	12·6	44·8	41·5	·262	3·0	0·4	88	545	76·4	36·1	0·9	3	7	17	2	2·1	7·1	20	1·12
		Mar.	29·674	1·011	63·0	23·0	40·0	53·7	37·2	16·5	44·2	40·7	·256	2·9	0·4	88	546	85·3	33·9	0·7	6	6	14	5	1·9	6·0	16	1·85
MARLBOROUGH COLLEGE (Wilts), Rev. Thomas A. Preston, M.A.	456	Jan.	29·138	1·481	57·3	25·2	32·1	46·5	34·1	12·4	40·0	39·7	·226	2·6	0·3	92	538	54·1	30·6	–	3	2	13	13	4·3	7·0	27	6·84
		Feb.	29·318	0·678	54·8	32·4	22·4	48·9	39·0	9·9	43·9	41·2	·259	3·0	0·3	91	539	75·3	35·7	–	2	3	13	11	3·9	8·1	23	2·65
		Mar.	29·319	1·040	58·9	22·5	36·4	50·8	37·2	13·6	43·2	39·7	·245	2·8	0·4	88	540	91·1	31·9	–	6	5	9	11	4·2	7·1	14	2·39
EAST TILBURY (Essex), Rev. R. Tyas, M.A., LL.D.		Jan.	29·616	1·539	56·5	25·7	30·8	48·3	35·0	13·3	41·7	39·3	·242	2·8	0·3	92	547	64·4	–	1·3	–	–	–	–	5·8	6·4	20	2·87
CHISLEHURST (Heathfield Lodge, Kent), Francis Nunes, Esq., M.A., F.M.S.	295	Jan.	29·283	1·501	53·3	26·5	28·8	48·7	34·9	13·8	40·9	32·8	·186	2·2	0·8	73	543	68·0	30·6	–	4	2	16	9	–	–	25	4·51
		Feb.	29·474	0·704	57·5	29·8	27·7	51·4	38·2	13·2	44·3	40·3	·251	2·8	0·6	86	542	88·9	33·5	–	2	5	16	6	–	–	21	0·93
		Mar.	29·459	1·006	61·2	22·2	39·0	53·6	36·8	16·8	44·4	39·0	·238	2·7	0·6	81	542	99·5	30·7	–	6	5	11	9	–	–	17	2·30
ROYAL OBSERVATORY (Kent), The Astronomer Royal.	159	Jan.	29·463	1·531	52·7	28·3	24·4	46·3	37·0	9·3	41·3	38·1	·230	2·7	0·4	89	545	61·0	31·3	0·8	3	3	14	11	–	6·9	20	3·63
		Feb.	29·645	0·710	57·9	32·4	25·5	51·7	39·2	12·5	44·8	40·7	·254	2·9	0·5	86	544	79·8	33·2	0·3	1	4	6	17	–	7·2	14	0·77
		Mar.	29·625	1·051	60·8	26·1	34·7	53·5	37·7	15·8	44·6	39·8	·245	2·8	0·5	84	544	89·9	32·5	0·4	6	4	11	10	–	6·5	16	2·13
THE GUILDHALL (London), William Haywood, Esq.		Jan.	29·475	1·522	53·0	36·0	17·0	47·3	40·3	7·0	43·7	39·1	·240	2·7	0·5	84	543	–	–	–	–	–	–	–	–	–	–	3·26
		Feb.	29·642	0·630	55·0	38·5	16·5	51·3	42·6	8·7	47·0	41·7	·264	3·1	0·6	83	542	–	–	–	–	–	–	–	–	–	–	0·85
		Mar.	29·563	1·000	60·0	31·3	28·7	51·4	41·8	9·6	46·1	39·7	·245	2·8	0·8	79	541	–	–	–	–	–	–	–	–	–	–	2·16
STREATLEY VICARAGE (Berks), Rev. J. Slatter, M.A., F.R.A.S.	150	Jan.	29·476	1·384	53·6	26·7	26·9	46·4	36·0	10·4	41·8	37·7	·227	2·6	0·5	86	544	52·2	32·2	1·6	2	5	13	11	–	8·1	23	5·47
		Feb.	29·681	0·732	57·6	30·8	26·8	52·1	39·3	12·8	45·2	42·0	·266	3·2	0·3	90	545	58·4	33·8	1·4	2	4	14	9	–	7·7	20	1·77
		Mar.	29·664	1·056	61·7	25·8	35·9	53·2	37·9	15·3	45·4	41·0	·256	3·0	0·5	86	544	61·9	31·9	1·3	7	6	11	7	–	6·7	15	2·14
ST. JOHN'S COLLEGE, BATTERSEA, Rev. J. P. Faunthorpe, B.A., F.R.G.S.	13	Jan.	29·595	1·536	54·5	25·0	29·5	47·7	34·5	13·2	41·3	37·9	·229	2·6	0·4	89	547	51·1	27·8	1·4	1	1	17	12	–	8·6	22	3·42
		Feb.	29·766	1·146	59·0	29·5	29·5	50·9	37·2	13·7	44·5	40·1	·250	2·9	0·6	81	547	62·0	31·9	1·5	0	2	23	4	–	7·7	20	1·17
		Mar.	29·762	1·044	68·0	24·0	44·0	54·4	36·2	18·2	44·4	42·3	·247	2·8	0·5	84	547	64·2	32·5	1·7	0	2	19	10	–	6·3	14	1·93
MARYLEBONE (London), Henry E. Segrave, Esq., F.M.S.	146	Jan.		1·522	55·5	27·0	28·5	46·3	35·3	11·0	41·9	38·3	·233	2·7	0·4	88	–	–	–	–	4	4	11	12	–	8·5	21	3·46
		Feb.		0·697	58·0	30·0	28·0	52·1	38·5	13·6	46·0	41·3	·261	3·0	0·8	85	–	–	–	–	3	5	12	9	–	7·3	19	1·18
		Mar.		1·036	63·0	24·5	38·5	53·7	35·5	18·2	44·1	43·2	·280	3·2	0·1	97	–	–	–	3·9	6	5	10	10	–	7·8	17	2·74
CAMDEN TOWN (London), G. J. Symons, Esq., F.M.S.	123	Jan.	29·502	1·551	52·8	27·4	25·4	46·1	36·3	9·8	41·6	38·5	·233	2·7	0·4	89	545	51·4	32·9	–	3	4	15	9	–	6·1	22	3·46
		Feb.	29·691	0·743	57·0	31·5	25·5	51·1	39·3	11·8	45·2	44·1	·258	2·9	0·5	86	545	46·8	35·3	–	5	4	16	4	–	6·6	25	0·96
		Mar.	29·674	1·016	61·1	26·1	35·0	53·5	37·9	15·6	45·2	40·9	·253	3·0	0·5	85	544	79·4	34·6	–	11	6	7	7	–	6·5	17	2·66
OXFORD (Oxfordshire), Rev. R. Main, M.A., F.R.S., F.R.A.S.	210	Jan.	29·378	1·486	53·0	29·8	23·2	46·1	36·7	9·4	41·3	37·4	·225	2·6	0·4	87	543	68·3	33·5	1·2	1	4	18	8	1·5	7·9	23	4·06
		Feb.	29·576	0·744	56·0	34·0	22·0	50·3	40·4	9·9	45·0	40·5	·251	2·9	0·6	84	543	–	36·8	1·0	2	4	16	7	1·7	8·2	17	1·50
		Mar.	29·564	1·009	60·0	24·2	35·8	52·1	38·4	13·7	44·6	38·2	·232	2·7	0·6	78	543	–	33·1	1·1	4	5	13	9	2·8	8·1	16	1·93
GLOUCESTER (Gloucester), E. Toller, Esq., M.D.	100	Jan.	29·518	1·560	55·4	27·5	27·9	47·2	37·3	9·9	42·1	37·9	·228	2·6	0·5	86	545	59·0	36·2	1·1	3	2	13	13	1·4	6·5	23	3·70
		Feb.	29·704	0·724	57·3	34·0	23·3	50·8	41·1	9·7	46·0	40·5	·253	2·9	0·7	82	544	73·7	40·4	1·6	3	3	10	11	3·3	7·1	18	2·11
		Mar.	29·726	1·104	63·5	26·8	36·7	54·6	40·2	14·4	46·3	40·1	·249	2·9	0·7	80	545	89·3	37·7	0·8	6	5	9	11	2·6	5·9	13	2·13
ROYSTON (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	Jan.	29·362	1·486	52·4	28·4	24·0	44·9	34·5	10·4	40·0	37·2	·222	2·5	0·4	90	544	–	–	–	–	–	–	–	–	6·4	22	2·92
		Feb.	29·548	0·692	55·6	29·4	26·2	49·9	37·2	12·7	43·5	40·2	·250	2·9	0·4	88	544	–	–	–	–	–	–	–	–	7·2	17	1·09
		Mar.	29·536	1·012	63·3	25·4	37·9	54·1	36·6	17·5	44·2	40·9	·257	2·9	0·5	89	543	–	–	–	6	2	16	7	–	6·4	13	2·11
CARDINGTON (near Bedford), Mr. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	100	Jan.	29·526	1·590	53·0	25·0	28·0	45·4	34·2	11·2	40·0	37·2	·222	2·5	0·4	90	547	45·7	28·5	1·1	3	1	21	6	–	7·0	19	2·60
		Feb.	29·720	0·630	56·0	30·4	25·6	50·3	38·0	12·3	44·0	40·9	·237	2·9	0·4	89	547	58·2	32·0	0·8	3	3	19	4	–	7·3	12	1·10
		Mar.	29·711	1·000	62·0	26·0	36·0	53·4	37·0	16·4	44·6	39·0	·238	2·9	0·6	88	546	71·0	29·4	0·7	6	5	11	9	–	5·7	12	1·75

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1872. Months.	Pressure of Atmosphere in Month. Mean.	Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean. Of all Highest.	Of all Lowest.	Daily Range.	Mean Temperature. Air.	Dew Point.	Vapour. Elastic Force.	In a cubic foot of Air. Mean.	Short of Saturation.	Mean Degree of Humidity, Sat^{n}. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Minimum on Grass.	Wind. Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
LEAMINGTON (Warwickshire), S. Urwick Jones, Esq., F.M.S.	195	Jan.	29·366	1·606	53·3	28·2	25·1	45·6	36·9	8·7	41·0	38·3	·231	2·7	0·3	90	543	–	–	0·8	4	2	7	18	–	–	21	3·81
		Feb.	29·557	0·792	54·2	35·0	19·2	49·5	40·0	9·5	44·1	42·7	·273	3·2	0·4	93	543	–	–	0·1	2	9	10	8	–	8·3	15	2·17
		Mar.	29·544	1·032	59·8	26·0	33·8	52·9	38·5	14·4	44·0	41·8	·265	3·0	0·3	92	543	–	–	0·8	7	8	7	9	–	6·8	15	1·60
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	Jan.	29·565	1·646	51·0	28·0	23·0	44·3	34·5	9·8	39·6	38·7	·235	2·8	0·1	97	548	63·2	26·5	1·0	3	4	13	11	8·9	6·7	22	4·34
		Feb.	29·778	0·690	53·4	29·2	24·2	48·8	37·0	11·8	42·8	42·3	·269	3·1	0·3	97	548	70·4	27·6	1·0	1	7	12	9	7·9	7·1	17	0·96
		Mar.	29·739	1·038	60·0	26·6	33·4	52·8	36·5	16·3	43·9	42·1	·266	3·1	0·3	92	547	93·7	27·0	1·0	5	5	12	9	7·3	4·6	16	2·72
NORWICH (Norfolk), C. M. Gibson, Esq., F.M.S.	42	Jan.	29·576	1·682	51·0	28·0	23·0	44·2	34·8	9·4	39·5	37·9	·228	2·7	0·2	94	549	–	–	–	4	4	16	7	–	–	19	3·01
		Feb.	29·778	0·732	54·0	30·0	24·2	48·0	36·5	11·5	42·1	40·1	·248	2·8	0·3	86	549	–	–	–	1	7	16	5	–	–	12	0·75
		Mar.	29·743	1·072	59·0	25·5	33·5	50·9	36·7	14·2	43·4	39·5	·242	2·8	0·5	86	548	–	–	–	5	6	13	7	–	–	16	3·02
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	Jan.	29·571	1·752	53·6	20·8	25·6	45·0	35·2	9·8	39·8	38·2	·230	2·8	0·2	95	548	61·0	32·3	0·6	3	8	14	6	4·2	6·2	20	2·54
		Feb.	29·780	0·724	56·0	31·1	24·9	49·6	40·0	9·6	44·0	41·6	·264	3·0	0·3	91	548	74·5	34·7	0·4	3	11	11	4	2·4	7·2	18	1·31
		Mar.	29·756	1·026	62·0	26·8	35·2	53·8	38·0	15·8	45·0	41·1	·258	3·0	0·4	86	546	94·1	34·1	0·5	5	8	10	8	2·8	5·3	16	2·44
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Monia Dalton, Esq., M.D.	100	Jan.	29·354	1·362	56·6	33·5	23·1	48·4	38·2	10·2	43·5	39·3	·235	2·7	0·5	83	540	–	–	1·0	–	–	–	–	–	7·1	21	3·35
		Feb.	29·586	0·736	56·7	35·7	21·0	51·0	41·0	10·0	46·1	41·4	·262	3·1	0·5	85	542	–	–	0·6	–	–	–	–	–	7·0	17	3·04
		Mar.	29·637	1·210	63·3	30·0	32·6	52·7	40·4	12·3	46·2	40·2	·250	2·9	0·7	81	543	–	–	0·6	4	7	7	13	–	7·1	17	2·19
DERBY (Derbyshire), John Davis, Esq.	174	Jan.	29·360	1·617	54·0	28·0	26·0	45·7	35·1	10·6	40·2	38·9	·237	2·8	0·2	95	544	–	–	–	3	2	18	8	–	–	25	3·72
		Feb.	29·560	0·743	55·0	30·0	22·0	48·8	38·8	10·0	43·6	41·1	·267	3·0	0·7	89	544	–	–	–	2	4	13	10	–	–	22	2·87
		Mar.	29·555	1·119	60·0	26·0	34·0	51·8	37·6	14·2	44·1	40·6	·254	2·9	0·4	87	543	–	–	–	7	3	13	8	–	–	16	1·84
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	241	Jan.	29·276	1·764	53·4	26·6	26·8	44·9	33·5	11·4	39·6	38·2	·231	2·7	0·1	95	543	52·8	26·5	0·7	2	3	18	8	2·3	7·0	22	3·32
		Feb.	29·489	0·712	56·3	30·7	25·6	49·3	37·7	11·6	43·4	41·6	·263	3·0	0·2	94	543	70·4	29·7	0·5	1	8	14	6	1·1	7·9	20	2·32
		Mar.	29·508	1·024	62·0	24·1	37·9	53·8	37·2	16·6	44·4	40·9	·256	2·9	0·5	88	542	91·9	27·8	0·5	7	5	10	9	2·6	6·1	16	1·70
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	Jan.	29·556	1·840	53·2	25·4	27·8	44·9	34·1	10·8	39·8	36·6	·217	2·5	0·4	89	548	53·8	27·3	1·2	4	1	23	3	–	6·6	11	1·71
		Feb.	29·760	0·714	56·2	25·2	31·0	49·1	36·4	12·7	42·8	39·2	·240	2·8	0·4	86	549	69·6	31·3	1·1	4	3	19	3	–	7·6	8	0·63
		Mar.	29·745	1·052	61·5	26·8	34·7	52·6	36·9	15·7	44·1	38·7	·235	2·7	0·6	81	547	99·7	31·9	1·3	7	4	14	6	–	5·5	12	1·51
HAWARDEN (Flint), T. Moffat, Esq., M.D., F.R.A.S.	270	Feb.	29·426	0·820	54·5	35·0	19·5	46·2	40·6	5·6	42·6	39·5	·242	2·8	0·3	89	543	72·7	21·7	1·8	2	2	14	11	1·6	7·6	24	2·65
		Mar.	29·440	1·192	61·5	30·0	31·5	50·7	40·0	10·7	43·6	42·1	·268	3·0	0·4	94	542	85·5	21·3	2·0	8	2	14	7	1·5	7·0	24	3·64
LIVERPOOL OBSERVATORY. John Hartnup, Esq., F.R.A.S.	197	Jan.	29·315	1·532	56·4	28·4	28·0	46·7	34·5	12·2	42·2	34·9	·203	2·4	0·7	76	541	–	–	1·3	2	7	15	7	–	6·7	22	3·43
		Feb.	29·528	0·821	55·3	35·0	20·3	48·9	38·4	10·5	44·2	39·8	·246	2·8	0·5	85	543	–	–	1·4	1	11	13	4	–	7·3	20	1·87
		Mar.	29·557	1·197	59·3	27·6	31·7	51·5	39·3	12·2	44·4	39·0	·238	2·7	0·6	81	543	–	–	1·2	5	9	9	8	–	6·5	19	2·65
ECCLES, near Manchester, T. Mackereth, Esq., F.R.A.S., F.M.S.	145	Jan.	29·347	1·622	55·2	23·0	32·2	45·8	34·3	11·5	40·6	36·7	·218	2·5	0·4	87	544	48·0	27·9	0·8	2	5	15	9	3·1	7·2	25	4·10
		Feb.	29·574	0·780	56·4	32·9	23·5	49·8	38·5	11·3	44·3	39·9	·249	2·2	0·5	85	543	55·8	31·1	0·3	1	6	15	7	1·7	7·8	24	2·85
		Mar.	29·590	1·228	63·7	25·5	38·2	52·0	37·5	14·5	44·4	38·7	·236	2·7	0·6	81	544	60·5	30·2	0·4	5	6	12	8	3·1	5·6	21	2·79
HALIFAX, (Yorkshire), Louis J. Crossley, Esq., F.M.S.	57	Mar.	29·201	1·167	61·8	22·0	39·8	49·8	36·7	13·1	41·9	39·9	·241	2·8	0·3	90	540	86·7	33·1	–	8	7	9	7	3·0	6·2	22	2·69
PARK ROAD OBSERVATORY (Halifax, Yorkshire), Edward Crossley, Esq., F.R.A.S.	618	Jan.	28·777	1·650	53·5	27·0	26·5	42·4	34·6	7·8	38·9	33·3	·191	2·2	0·6	82	535	52·4	20·1	0·5	2	5	10	14	–	7·8	20	5·26
		Feb.	29·052	0·659	52·0	31·0	21·0	45·1	36·6	8·5	40·9	38·0	·230	2·7	0·3	90	538	62·9	33·1	0·4	–	–	–	–	–	8·3	23	4·42
		Mar.	29·084	1·160	60·0	24·0	36·0	47·8	34·9	12·9	41·0	32·5	·184	2·2	0·9	72	538	77·4	30·8	0·5	5	7	9	10	–	6·5	17	3·65
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	Jan.	29·508	1·892	54·0	24·0	30·0	43·0	34·7	8·3	39·0	36·7	·218	2·5	0·3	92	549	50·9	33·8	–	–	–	–	–	2·6	8·3	12	2·20

(Yorkshire), Louis C. Miall, Esq.		Mar.	29·605	1·076	65·0	25·0	40·0	52·3	36·9	15·4	44·0	36·2	·213	2·5	0·8	73	545	66·0	–	1·3	7	4	8	12	–	7·6	19	2·29
YORK (Yorkshire), J. F. Fryer, Esq.	50	Jan.	29·306	1·820	58·0	24·0	34·0	42·9	34·7	8·2	39·2	36·9	·220	2·6	0·3	92	544	–	–	–	3	6	17	5	–	–	17	3·12
		Feb.	29·780	0·768	50·0	33·5	16·5	45·6	38·0	7·6	41·6	41·2	·259	3·0	0·0	98	550	–	–	–	3	4	17	5	–	–	21	2·34
		Mar.	29·670	1·092	58·5	26·0	32·5	49·6	37·3	12·3	42·6	41·1	·258	3·0	0·2	94	547	–	–	–	7	5	16	3	–	–	20	2·28
COCKERMOUTH (Cumberland), H. Dodgson, Esq., M.D., F.R.A.S., F.M.S.	148	Jan.	29·263	1·624	55·2	26·3	28·9	45·9	37·7	8·2	41·7	38·2	·231	2·6	0·3	88	541	53·1	29·9	0·9	2	4	21	4	4·1	7·2	23	7·00
		Feb.	29·525	0·912	57·3	33·2	24·1	49·6	39·8	9·8	44·3	40·0	·247	2·9	0·5	84	543	68·0	32·5	0·6	2	6	18	3	2·7	6·9	16	3·34
		Mar.	29·585	1·262	62·9	22·2	40·7	50·7	38·9	11·8	44·0	40·5	·252	2·9	0·4	77	544	79·1	32·3	0·5	6	7	15	3	3·3	6·9	19	3·57
ALLENHEADS (Northumberland), Mr. S. Stobbs, Assistant to W. B. Beaumont, Esq., M.P.	1360	Jan.	28·050	1·419	48·0	23·9	24·1	39·7	32·2	7·5	35·7	34·8	·196	2·3	0·2	94	525	59·8	30·7	2·9	–	–	–	–	–	8·0	24	6·21
		Feb.	28·424	0·761	49·0	28·3	20·7	44·0	35·5	8·5	38·5	36·6	·217	2·5	0·4	93	528	67·6	33·8	2·2	2	3	17	7	–	7·9	27	4·94
		Mar.	28·238	0·988	55·1	20·7	34·4	45·5	33·8	11·7	38·1	35·8	·209	2·4	0·3	91	526	71·3	32·6	1·9	–	–	–	–	–	6·6	24	5·44
SILLOTH RECTORY (Cumberland), Rev. Francis Bedford, M.A., F.R.A.S., F.M.S.	28	Jan.	29·344	1·688	55·0	26·0	29·0	46·3	36·5	9·8	41·0	38·2	·231	2·6	0·4	88	543	62·0	32·4	1·5	4	4	9	14	10·3	6·7	22	5·94
		Feb.	29·643	0·917	56·3	31·0	25·3	49·8	38·7	11·1	43·5	39·6	·244	2·8	0·4	86	546	71·2	34·5	1·2	1	12	9	7	9·1	6·4	20	3·02
		Mar.	29·682	1·241	65·0	26·6	38·4	52·4	37·9	14·5	44 2	39·8	·245	2·8	0·5	84	546	78·6	33·4	1·1	5	9	9	8	8·4	6·8	15	2·68
CARLISLE (Cumberland), I. Cartmell, Esq., F.M.S.	114	Jan.	29·307	1·517	55·8	24·5	31·3	46·4	35·0	11·4	40·5	38·3	·231	2·7	0·3	92	543	54·4	30·2	1·4	3	5	17	6	7·5	6·9	25	3·52
		Feb.	29·563	0·869	53·9	28·2	25·7	48·3	37·5	10·8	42·5	38·7	·236	2·7	0·4	87	545	64·3	32·1	1·4	1	9	15	4	6·9	6·9	28	2·42
		Mar.	29·594	1·181	61·3	23·8	37·5	50·2	37·4	12·8	42·8	39·0	·238	2·9	0·4	86	545	77·0	31·9	1·5	5	7	11	8	6·5	6·6	14	2·89
BYWELL (Northumberland), Mr. John Dawson, Assistant to W. B. Beaumont, Esq., M.P.	87	Jan.	29·342	1·582	56·0	27·0	29·0	44·9	36·4	8·5	40·1	34·4	·199	2·3	0·6	80	544	47·8	29·2	1·4	3	8	9	11	–	6·1	21	4·30
		Feb.	29·601	0·836	55·0	31·0	24·0	48·1	38·2	9·9	42·7	39·0	·220	2·5	0·6	89	546	53·0	31·2	1·1	2	6	8	13	–	6·5	24	3·72
		Mar.	29·614	1·106	60·0	27·0	33·0	49·4	37·7	11·7	42·1	36·3	·217	2·5	0·6	80	547	56·9	30·7	1·1	7	8	5	11	–	5·7	24	4·60
NORTH SHIELDS (Northumberland), Robert Spence, Esq.	124	Jan.	29·379	1·576	56·0	28·2	27·8	46·0	35·3	10·7	40·5	36·8	·219	2·5	0·4	87	542	–	33·9	1·7	5	4	10	12	–	7·4	21	2·78
		Feb.	29·656	0·841	54·0	33·0	21·0	47·8	38·9	8·9	42·0	39·3	·241	2·7	0·6	91	547	–	37·0	1·6	8	4	13	9	–	7·7	23	2·39
		Mar.	29·692	1·165	55·6	25·0	30·6	47·2	37·4	9·8	41·4	37·5	·226	2·6	0·4	87	549	–	35·7	1·7	5	6	9	11	–	6·0	19	3·45
MILTOWN (Banbridge, Ireland), John Smyth, Esq., Jun., M.A., M.I.C.E.I.	200	Jan.	29·164	1·648	53·0	26·0	27·0	44·9	33·8	11·1	39·6	36·8	·219	2·6	0·3	90	541	56·8	30·1	2·4	3	6	18	4	4·7	4·6	23	4·09
		Feb.	29·375	1·008	53·0	29·0	24·0	48·2	37·8	10·4	42·7	39·3	·240	2·8	0·4	88	541	70·9	34·1	2·2	1	9	17	2	4·7	5·3	23	3·52
		Mar.	29·475	1·112	59·0	24·0	35·0	49·5	37·6	11·9	43·5	38·9	·237	2·7	0·4	83	543	81·6	33·7	2·2	8	6	14	3	4·4	5·1	19	2·39
CULLODEN (Inverness, Scotland), A. Forbes, Esq., F.M.S.	104	Jan.	29·161	1·888	50·6	30·8	19·8	41·7	36·6	5·1	37·4	35·5	·208	2·4	0·3	88	542	52·9	20·6	0·5	0	4	18	9	8·7	5·8	13	2·54
		Feb.	29·538	1·146	51·4	31·9	19·5	44·8	38·7	6·1	41·5	36·6	·217	2·5	0·4	84	546	90·8	20·6	0·3	1	5	16	7	8·3	5·1	11	0·52
		Mar.	29·584	1·071	56·6	29·5	27·1	46·0	39·1	6·9	39·8	36·8	·224	2·5	0·6	82	546	98·2	16·1	0·3	4	10	9	8	8·6	5·4	17	0·84

Second Rain-gauges are placed—

			January.		February.		March.		Total during the Quarter,
At Eastbourne,	at the height of	4 feet *above the ground*, the amount collected was	5·78 inches.	-	2·24 inches.	-	2·97 inches.	-	10·94 inches.
„ Portsmouth,	„	20 feet „	5·11 „	-	1·54 „	-	„	-	„
„ Strathfield Turgiss,	„	33 feet „ „	3·49 „	-	1·05 „	-	1·11 „	-	5·65 „
„ Eccles, Manchester,	„	34 feet „ „	3·02 „	-	2·21 „	-	2·17 „	-	7·40 „
„ Allenheads,	„	6½ feet „ „	7·80 „	-	5·66 „	-	„	-	„
„ Carlisle,	„	3 feet „ „	1·15 „	-	1·67 „	-	1·71 „	-	4·53 „
„ Miltown, Ireland,	„	40 feet „ „	3·54 „	-	2·37 „	-	2·07 „	-	7 98 „
„ Brighton,	„	35 feet „ „	3·82 „	-	3·15 „	-	1·72 „	-	7·69 „
„ Radcliffe Observatory,	„	23 feet „ „	3·76 „	-	1·38 „	-	1·73 „	-	6·87 „
„ Marlborough College,	„	8 inches „ „	6·46 „	-	2·55 „	-	2·30 „	-	11·31 „
„ „	„	1 foot „ „	6·41 „	-	2·49 „	-	2·26 „	-	11·16 „
„ Cardington,	„	36 feet „ „	2·25 „	-	0·84 „	-	1·40 „	-	4·49 „
„ Boston,	„	feet „ „	„	-	—	-	„	-	„
„ Nottingham,	„	25½ feet „ „	3·08 „	-	2·21 „	-	1·58 „	-	6·82 „
„ Wisbech,	„	8 feet „ „	2·33 „	-	1·16 „	-	2·23 „	-	5·76 „
„ Aldershot,	„	25 feet „ „	4·26 „	-	1·72 „	-	1·59 „	-	7·57 „
„ Cockermouth,	„	6½ feet „ „	6·78 „	-	3·25 „	-	3·41 „	-	13·44 „
„ Holkham,	„	4 feet „	1·71 „	-	0·63 „	-	1·51 „	-	3·85 „

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind: Mean Estimated Strength.	Wind: Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°						
Guernsey	29·488	57·5	31·5	26·0	49·7	42·5	19·0	7·2	45·8	42·0	·268	3·1	0·5	87	541	—	—	1·4	3	7	11	9	4·1
Helston	29·510	64·0	30·0	34·0	54·2	43·8	28·0	10·4	48·8	42·2	·269	3·2	0·8	78	540	65·7	38·6	2·2	5	4	11	10	5·5
Truro	29·417	58·0	25·0	33·0	52·0	41·5	28·3	10·5	46·1	41·8	·265	3·0	0·5	86	543	—	—	2·8	5	5	10	11	—
Sidmouth	29·468	57·1	26·3	30·8	49·5	40·3	25·4	9·2	44·8	42·3	·268	3·1	0·3	81	545	—	—	1·3	5	3	9	13	—
Eastbourne	29·525	66·1	26·8	39·3	50·4	39·3	27·8	11·1	45·0	41·5	·263	3·1	0·5	88	546	74·4	33·9	0·6	4	4	13	9	5·6
Osborne	29·496	59·7	22·3	37·4	50·5	38·4	29·0	12·1	44·0	41·5	·263	3·0	0·3	92	544	65·5	35·8	0·2	4	4	15	8	—
Bournemouth	29·609	57·5	27·2	30·3	48·7	40·4	24·0	8·3	44·3	41·1	·260	3·0	0·4	89	547	—	—	—	6	4	10	10	—
Worthing	29·488	58·3	27·9	30·4	49·4	40·4	24·2	9·0	44·3	41·1	·258	3·0	0·4	89	546	90·4	35·8	1·1	5	4	13	9	6·4
Brighton	29·510	57·4	28·4	29·0	48·1	40·0	21·7	8·1	43·6	41·5	·263	3·0	0·2	93	544	81·5	34·6	1·0	5	5	13	7	0·9
Lymington	29·487	57·9	24·5	33·4	50·0	39·9	26·3	10·1	44·6	41·6	·265	3·0	0·4	92	545	—	—	0·6	4	5	11	10	—
Taunton	29·448	60·4	23·9	36·5	51·4	37·5	32·2	13·9	44·4	42·1	·269	3·0	0·4	91	545	58·1	36·0	0·3	4	3	9	14	6·2
Wilton House	29·470	61·7	23·0	38·7	50·5	36·0	32·6	14·5	43·7	41·2	·261	3·0	0·3	92	543	77·4	34·6	1·4	5	4	17	4	4·6
Barnstaple	29·431	61·0	29·0	32·0	51·3	41·3	24·8	10·0	46·6	41·8	·265	3·0	0·6	84	542	—	—	1·2	3	5	15	8	—
Aldershot Camp	29·508	60·6	24·8	35·8	50·2	37·2	27·5	13·0	42·9	39·5	·244	2·8	0·4	88	542	74·4	33·7	1·5	3	5	13	9	2·4
Strathfield Turgiss	29·522	61·2	21·8	39·4	49·8	36·5	32·1	13·3	43·4	38·8	·236	2·7	0·5	84	544	82·5	31·2	0·9	4	5	12	9	5·0
Weybridge Heath	29·532	63·0	23·0	40·0	50·4	37·4	30·0	13·0	43·3	40·2	·250	2·9	0·3	89	546	73·4	34·5	0·8	5	6	16	4	1·9
Marlborough College	29·515	58·9	22·5	36·4	48·7	36·8	30·3	11·9	42·4	40·2	·243	2·8	0·3	90	539	73·5	32·7	—	4	3	12	12	4·1
Chislehurst	29·520	61·2	22·2	39·0	51·2	36·6	31·8	14·6	43·3	37·7	·225	2·6	0·7	80	542	85·5	31·6	—	4	4	14	8	—
Royal Observatory	29·509	60·8	26·1	34·7	50·5	38·0	28·2	12·5	43·6	39·5	·243	2·8	0·5	86	544	76·9	32·0	0·5	3	4	10	13	—
Streatley Vicarage	29·524	61·7	25·8	35·9	50·6	37·7	29·9	12·9	44·1	40·2	·250	2·9	0·4	87	544	57·5	32·6	1·4	4	5	13	9	—
St. John's Battersea	29·480	68·0	24·0	44·0	51·0	36·0	34·3	15·0	43·4	40·1	·242	2·8	0·5	85	547	59·1	30·7	1·5	0	2	20	9	—
Marylebone	—	63·0	24·5	38·5	50·7	36·4	31·7	14·3	44·0	40·9	·258	3·0	0·4	90	—	—	—	—	4	5	11	10	—
Camden Town	29·483	61·1	26·1	35·0	50·2	37·8	28·6	12·4	44·0	40·2	·248	2·9	0·5	87	545	65·2	34·3	—	6	5	13	7	—
Oxford	29·500	60·0	24·2	35·8	49·5	38·5	27·0	11·0	43·6	38·7	·236	2·7	0·5	83	543	—	34·5	1·1	2	4	16	8	2·0
Gloucester	29·513	63·5	26·8	36·7	50·9	39·5	29·3	11·3	44·8	39·5	·243	2·8	0·6	83	545	73·7	38·1	1·2	4	4	11	12	2·4
Royston	29·534	63·3	25·4	37·9	49·6	36·1	29·4	13·5	42·6	39·4	·243	2·8	0·4	89	544	—	—	—	—	—	—	—	—
Cardington	29·522	62·0	25·0	37·0	49·7	36·4	29·9	13·3	42·9	39·0	·239	2·8	0·5	89	547	58·3	30·0	0·9	4	3	17	6	—
Leamington	29·447	59·8	26·0	33·8	49·3	38·5	26·0	10·8	43·0	40·9	·256	3·0	0·3	92	543	—	—	0·6	4	6	8	12	—
Somerleyton Rectory	29·493	60·0	26·6	33·4	48·6	36·0	26·9	12·6	42·1	41·0	·257	3·0	0·2	95	548	75·8	27·0	1·0	3	5	12	10	8·0
Norwich	29·515	59·0	25·5	33·5	47·7	36·0	26·8	11·7	41·7	39·2	·239	2·8	0·3	89	549	—	—	—	3	6	15	6	—
Wisbech	29·466	62·0	26·8	35·2	49·5	37·7	28·6	11·8	42·9	40·3	·251	2·9	0·3	91	547	76·5	33·7	0·5	4	9	12	6	3·1
Llandudno	29·386	63·3	30·7	32·6	50·7	39·9	25·6	10·8	45·3	40·3	·249	2·9	0·6	83	542	—	—	0·7	—	—	—	—	—
Derby	29·428	60·0	26·0	34·0	48·8	37·2	27·3	11·6	42·6	40·3	·253	2·9	0·4	90	544	—	—	—	4	3	14	9	—
Nottingham	29·436	62·0	24·1	37·9	49·3	36·1	30·1	13·2	42·5	40·2	·250	2·9	0·3	92	543	71·7	28·0	0·6	3	5	14	8	2·0
Holkham	29·499	61·5	25·2	36·3	48·9	35·8	31·2	13·1	42·2	38·2	·231	2·7	0·5	85	548	74·4	30·2	1·2	5	3	19	4	—
Liverpool	29·457	59·3	27·6	31·7	49·0	37·4	26·7	11·6	43·6	37·9	·229	2·6	0·6	81	542	—	—	1·3	3	9	12	6	—
Eccles	29·429	63·7	23·0	40·7	49·2	36·8	31·3	12·4	43·1	38·4	·234	2·7	0·5	84	544	54·8	29·7	0·5	3	6	14	8	2·6
Park Road	29·462	60·0	24·0	36·0	45·1	35·4	27·8	9·7	40·3	34·6	·202	2·4	0·6	81	537	63·9	31·3	0·4	—	—	—	—	—
Stonyhurst	29·396	60·0	22·4	37·6	47·9	38·4	28·3	9·5	42·5	39·0	·238	2·8	0·4	88	539	80·9	35·1	1·1	3	5	14	7	—
Leeds	—	65·0	25·0	40·0	49·0	36·3	31·3	12·7	42·8	36·9	·219	2·6	0·6	79	545	—	—	1·3	4	4	11	11	—
York	29·394	58·5	24·0	34·5	46·0	36·7	27·7	9·4	41·1	39·7	·246	2·9	0·2	95	547	—	—	—	4	5	17	14	—
Cockermouth	29·377	62·9	22·2	40·7	48·7	38·8	31·2	9·9	43·3	39·6	·243	2·8	0·4	86	543	66·7	31·6	0·7	3	6	18	3	3·4
Silloth	29·347	65·0	26·0	39·0	49·5	37·7	30·9	11·8	42·9	39·2	·240	2·7	0·4	86	545	70·6	33·4	1·2	3	8	9	10	9·2
Carlisle	29·378	61·3	23·8	37·5	48·3	36·6	31·5	11·7	41·9	38·7	·235	2·8	0·4	88	544	65·2	31·4	1·4	3	7	14	6	7·0
Bywell	29·402	60·0	27·0	33·0	47·5	37·4	28·7	10·0	41·6	36·6	·212	2·4	0·6	83	546	52·6	30·4	1·2	4	7	7	12	—
North Shields	29·483	56·0	25·0	31·0	47·0	37·2	26·5	9·8	41·3	37·9	·229	2·6	0·5	88	546	—	35·5	1·7	4	5	11	11	—
Miltown (Ireland)	29·325	59·0	24·0	35·0	47·5	36·4	28·7	11·1	41·9	38·3	·232	2·7	0·4	87	542	69·8	32·6	2·3	4	7	16	3	4·6

The highest temperatures of the air were at St. John's, Battersea, 68°·0; Eastbourne, 66°·1; Leeds, 65°·0; Silloth, 65 Helston, 64°·0.

The lowest temperatures of the air were at Strathfield Turgiss, 21°·8; Chislehurst, 22°·2; Cockermouth, 22°·2; Osborne at Stonyhurst, 22°·4.

The greatest daily ranges of the temperature of the air were at St. John's, Battersea, 15°·0; Chislehurst, 14°·6; Wi 14°·5; Marylebone, 14°·3; and at Taunton, 14°·3.

The least daily ranges of the temperature of the air were at Worthing, 7°·0; Guernsey, 7°·2; Brighton, 8°·1; Bournem Sidmouth, 9°·2; and at York, 9°·4.

The greatest numbers of rainy days were at Stonyhurst, 86; Truro, 74; Barnstaple, 72; Leeds, 72; and at Helston, 71.

The least numbers of rainy days were at Holkham, 31; Cardington, 43; Norwich, 47; Royal Observatory, 50; and at Leami

The heaviest falls of rain were at Truro, 19·09 inches; Helston, 16·98 inches; Barnstaple, 14·97 inches; Stonyhurst, 1 Cockermouth, 13·91 inches; and at Guernsey, 13·50 inches.

The least falls of rain were at Holkham, 3·85 inches; Cardington, 5·45 inches; Royston, 6·12 inches; Wisbech, 6·20 in St. John's, Battersea, 6·52 inches.

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind: Mean Estimated Strength.	Wind: Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°						
Guernsey	29·488	57·5	31·5	26·0	49·7	42·5	19·0	7·2	45·8	42·0	·268	3·1	0·5	87	541	—	—	1·4	3	7	11	9	4·1
Between the latitudes 50° and 51°	29·502	60·1	26·5	33·6	50·7	40·6	26·7	10·1	45·3	41·6	·264	3·1	0·5	86	544	74·0	36·0	1·4	5	4	12	10	5·8
51° and 52°	29·497	61·3	24·7	36·6	50·3	37·8	29·3	12·5	43·9	40·2	·250	2·9	0·5	87	544	72·2	33·7	1·0	4	4	13	9	3·3
52° and 53°	29·472	61·3	26·1	35·2	49·2	37·0	28·2	12·2	42·8	39·9	·247	2·9	0·4	89	545	71·3	29·8	0·8	4	5	14	8	4·4
53° and 54°	29·427	61·1	24·3	36·8	47·7	36·8	28·5	10·9	42·2	37·7	·224	2·7	0·5	86	542	66·5	32·0	0·9	3	6	13	9	2·6
54° and 55°	29·373	62·3	24·7	37·6	48·5	37·6	30·6	10·9	42·4	38·5	·232	2·7	0·4	86	544	63·8	31·7	1·1	3	7	12	8	6·5
North Shields	29·483	56·0	25·0	31·0	47·0	37·2	26·5	9·8	41·3	37·9	·229	2·6	0·5	88	546	—	35·5	1·7	4	5	11	11	—
Miltown, Banbridge (Ireland)	39·325	59·0	24·0	35·0	47·5	36·4	28·7	11·1	41·9	38·3	·232	2·7	0·4	87	542	69·8	32·6	2·3	4	7	16	3	4·6
Mean for the Quarter 50° to 55° Year 1869	29·678	58·8	25·0	33·8	47·9	36·8	28·1	11·1	41·9	37·6	·227	2·6	0·5	85	549	—	—	1·3	6	5	8	11	—
„ 1870	29·757	57·9	19·3	38·1	44·1	33·7	32·2	10·4	38·5	34·7	·202	2·4	0·4	86	554	63·8	29·1	1·1	8	7	7	8	4·6
„ 1871	29·713	67·0	14·1	52·8	46·2	34·6	34·2	11·9	40·1	36·2	·216	2·5	0·4	86	551	66·4	28·1	1·2	5	6	9	10	—
„ 1872	29·454	61·2	25·2	36·0	49·8	38·0	28·7	11·3	43·3	39·4	·243	2·8	0·5	87	544	69·6	22·6	1·0	4	5	13	9	4·5

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING JUNE 30, 1872.

REMARKS ON THE WEATHER DURING THE QUARTER ENDING JUNE 30TH, 1872.

By JAMES GLAISHER, ESQ., F.R.S., *&c., Secretary of The Meteorological Society.*

The weather at the end of March and till the first week in May was very changeable, there were alternately a few days of warmth, and then a few days of cold, the warm periods preponderating both in duration and in excess of temperature over the defects of temperature and cold. Till May 5th the temperature was in excess to the amount of 2¾° on the average daily. From the 6th of May to the 12th of June, with the exception of three or four days of moderate warm weather at the end of May, the weather was cold, the sky mostly cloudy, the nights of low temperature with hoar frost and frequent rain, the average deficiency of daily temperature was 3½°. On June 13th a warm period set in, and for some days the weather was fine, bright, and hot, but towards the end of the month it was again changeable, there was an excess of daily temperature above these averages of 3¾°. Some heavy thunderstorms took place during the hot weather in June 17th, 18th, and 19th of June, principally over the Northern and Midland Counties.

The changeable weather which has thus prevailed nearly throughout the quarter, sometimes warm but frequently cold, till the middle of June, caused all cereal crops to be in a backward state, as they did not receive sufficient warmth and sunshine; their forward state in the early spring was entirely lost through the low temperature and harsh weather in the month of May. Under the influence of the bright sunshine and hot weather about the middle of June, everything progressed satisfactorily and rapidly; at the end of the quarter vegetation generally was about ten or twelve days later than in an average season. The wheat crop was generally in ear or in bloom. The storms in June had laid some and blown off the blossoms in some cases, but only to a small portion of the whole, and it was generally expected the yield would be that of a full average.

The hay crop was spoken of as generally very good, and the heaviest for many years.

The potatoe crop is also spoken of as good and abundant.

The average temperature of these three months differs less than ¼ of a degree from the average of the same month in the preceding 30 years.

On the 1st April the reading of the barometer at the height of 159 feet above sea level was 29·3 in. A slight decrease to 29·2 in. occurred on the 2d, but on the same day a decided increase set in, and by the 6th, 30·3 in. was reached. From the 7th to the 15th high values generally were recorded, but on the 16th a depression commenced and lasted till about noon of the 21st, when 28·9 in., the absolute minimum for the month was registered. From this date, with but slight exceptions, increasing values were recorded till the end of the month. The absolute range of reading during April was 1·4 in.

During May the movements were numerous, but not of very great magnitude, the principal being a decrease from 30·2 in. on the 1st to 29·2 in. on the 7th, (though broken by a slight increase on the 5th) and a general increase from 29·4 in. on the 18th to 30·2 in. on the 26th. The range of reading for the month was one inch.

The principal movements during June were a general decrease to 29·3 in. on the 9th, and an increase to 30·1 in. on the 16th. From the 17th the oscillations were numerous, and the mean daily values fluctuated above and below the average in periods of three or four days. The range of reading during the month was but 8 tenths of an inch.

For each of the three months the mean value was 29·7 in., and the departure from average, −0·03 in., −0·05 in., and −0·08 in. respectively.

The mean temperature of April was 48°·3, being 2°·3 higher than the average of 101 years, higher than the corresponding value last year, but lower than those in 1869 and 1870.

The mean temperature of May was 50°·9, being 1°·7 lower than the average of 101 years, lower than the temperature in the same month in 1871 and 1870, but higher than in 1869, when 50°·5 was recorded.

The mean temperature of June was 59°·2, being 1°·0 higher than the average of 101 years, 4°·4 higher than the corresponding value last year, but 1°·7 lower than in 1870.

The mean high day temperatures were 1°·5 and 0°·2 respectively higher than their averages in April and June, but 2°·5 lower in May.

The mean low night temperatures of April were 1°·5 higher, of June, the same as, and of May 1°·6 lower than their respective averages.

Therefore the days and nights of April were warm, and of May cold, while those of June were of equable temperature.

The daily ranges of temperature were greater than their respective averages in April and June, but less in May.

The fall of rain was 0·7 in. and 0·3 in. respectively in defect of the average in April and June, but 0·9 in. in excess in May.

The mean temperature of the air in the three months ending May, constituting the three spring months, was 47°·9, being 1°·4 higher than the average of 101 years.

1872. Months.	Temperature of Air. Mean.	Air. Diff. from average of 101 years.	Air. Diff. from average of 31 years.	Evaporation. Mean.	Evaporation. Diff. from average of 31 years.	Dew Point. Mean.	Dew Point. Diff. from average of 31 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 31 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 31 years.	Weight of vapour in a Cubic Foot of Air. Mean.	Weight of vapour. Diff. from average of 31 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
April	48·3	+2·3	+1·2	44·8	+0·7	41·0	+0·3	19·3	+0·7	50·7	0·257	+0·008	2·9	0·0
May	50·9	−1·7	−2·1	47·3	−1·9	43·6	−1·9	19·7	−0·8	54·5	0·284	−0·019	3·3	−0·1
June	59·2	+1·0	+0·2	54·9	+0·3	51·1	+0·4	21·3	+0·2	61·9	0·375	+0·005	4·2	+0·1
Mean	52·8	+0·5	−0·2	49·0	−0·3	45·2	−0·4	20·1	0·0	55·7	0·305	−0·004	3·5	0·0

1872. MONTHS.	Degree of Humidity. Mean.	Degree of Humidity. Diff. from average of 31 years.	Reading of Barometer. Mean.	Reading of Barometer. Diff. from average of 31 years.	Weight of a Cubic Foot of Air. Mean.	Weight of a Cubic Foot of Air. Diff. from average of 31 years.	Rain. Amount.	Rain. Diff. from average of 57 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
April -	76	− 3	29·735	−0·034	542	− 1	1·0	−0·7	273	8	19	3	21·8	45·3
May -	76	0	29·736	−0·045	539	− 2	3·1	+0·9	257	5	15	11	25·8	47·4
June -	75	+ 1	29·735	−0·081	530	− 2	1·6	−0·3	264	1	8	21	28·5	54·8
Mean -	76	− 1	29·735	−0·053	537	− 2	Sum 5·7	Sum 0·0	Mean 265	Sum 14	Sum 42	Sum 35	Lowest 21·8	Highest 54·8

NOTE.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the plus sign (+) signifies above the average.

Thunderstorms occurred on the 17th of April at Carlisle; on the 22d at Osborne; on the 23d at Stonyhurst, Allenheads, and Carlisle; on the 24th at Cardington, Stonyhurst, Wisbech, Bywell, and North Shields; on the 25th at Liverpool, Eccles, Halifax, Hull, Stonyhurst, and York; on the 26th at Stonyhurst. On the 6th of May at Somerleyton; on the 7th at Strathfield Turgiss, Weybridge Heath, London, and Norwich; on the 8th at Osborne, Marlborough, Streatley, Oxford, Gloucester, and Norwich; on the 9th at Guernsey, Portsmouth, Worthing, Salisbury, Chislehurst, London, Oxford, Eccles, and Stonyhurst; on the 15th at Oxford and Eccles; on the 20th at Helston; on the 22d at Truro, Wisbech, and North Shields; on the 23d at Helston, Taunton, and Somerleyton; and on the 31st at London. On the 2d of June at Royston and Wisbech; on the 3d at Brighton and Leamington; on the 7th at Helston, Marlborough, Gloucester, Cardington, Halifax, Stonyhurst, and Leeds; on the 8th at London and Stonyhurst; on the 9th at Eccles, Halifax, Stonyhurst, Silloth, and Carlisle; on the 10th at Worthing, Brighton, Leamington, and Silloth; on the 17th at Cardington, Wisbech, Hawarden, Halifax; on the 18th at Guernsey, Helston, Barnstaple, Gloucester, Cardington, Wisbech, Hawarden, Eccles, Halifax, Stonyhurst, Leeds, Silloth, Carlisle, and North Shields; on the 19th at Sidmouth, Taunton, Salisbury, Lymington, Marlborough, Gloucester, Royston, Cardington, Wisbech, Llandudno, Hawarden, Eccles, Cockermouth, and Carlisle; on the 20th at Silloth; on the 24th at Osborne, Strathfield Turgiss, Lymington, Marlborough, Chislehurst, London, Royston, Cardington, Leamington, Wisbech, Hawarden, Eccles, Halifax, Stonyhurst, Leeds, and North Shields; on the 25th at Wisbech, Eccles, Leeds, and North Shields; on the 26th at Salisbury, Wisbech, and Eccles; on the 27th at Stonyhurst and Silloth; and on the 28th at Carlisle.

Thunder was heard, but lightning was not seen, on the 5th of April at Halifax; on the 17th at Allenheads, Halifax, and Cockermouth; on the 18th at Hawarden and Helston; on the 19th at Gloucester; on the 21st at Oxford; on the 22d at Portsmouth and Hawarden; on the 23d at Cardington, Eccles, Halifax, Hawarden, Stonyhurst, and Bywell; on the 24th at Somerleyton, Eccles, Halifax, York, and Allenheads; and on the 26th at Eccles and Miltown. On the 6th of May at Hull; on the 7th at Chislehurst, Royston, Leamington, Somerleyton, Wisbech, Eccles, and Hull; on the 8th at Worthing, Brighton, Chislehurst, Leamington, Somerleyton, Hull, and Silloth; on the 9th at Weybridge, Streatley, London, Somerleyton, Silloth, and Carlisle; on the 10th at Chislehurst; on the 15th at Liverpool, Stonyhurst, Cockermouth, and Carlisle; on the 21st at Hull and Carlisle; on the 22d at Salisbury, Taunton, Gloucester, and Somerleyton; on the 23d at Hull and North Shields; and on the 24th at Worthing, Brighton, and Chislehurst. On the 2d of June at Chislehurst and Cardington; on the 3d at Norwich and Hull; on the 7th at Taunton, and Royston; on the 8th at Llandudno and North Shields; on the 9th at Llandudno and Hull; on the 10th at Royston, Cardington, and Hull; on the 17th at Osborne, London, Oxford, Halifax, Hull, and Stonyhurst; on the 18th at Weybridge, London, Landudno, Hull, and Cockermouth; on the 19th at Portsmouth, Worthing, Weybridge and Stonyhurst; on the 20th at North Shields; on the 21st at Marlborough and Stonyhurst; on the 24th at Portsmouth, Worthing, Weybridge, Streatley, Oxford, and Gloucester; on the 25th at Halifax; and on the 26th at Cardington and Halifax.

Lightning was seen, but thunder was not heard, on the 17th of April at Carlisle; on the 23d at Stonyhurst; on the 25th at Worthing, Brighton, Chislehurst, Cardington, and Somerleyton; on the 26th at Chislehurst and Somerleyton; and on the 28th at Royston. On the 8th of May at Marlborough; on the 9th at Chislehurst; and on the 16th at Portsmouth. On the 11th of June at Oxford; on the 18th at Oxford, Wisbech, and Llandudno; on the 19th at Truro; on the 24th at Brighton, Weybridge, and Oxford; and on the 27th at London.

Solar halos were seen on the 5th of April at Cockermouth; on the 6th at North Shields; on the 7th at Strathfield Turgiss, Weybridge, and Oxford; on the 9th at Brighton and Oxford; on the 10th at Halifax; on the 12th at Halifax and York; on the 21st at Strathfield Turgiss; on the 22d at Oxford; on the 26th at Oxford; on the 28th at Liverpool; on the 29th at Brighton, Weybridge, and Halifax; on the 30th at Oxford. On the 7th of May at Halifax; on the 12th at Halifax; on the 14th at Brighton; on the 15th at Wisbech; on the 30th at Oxford. On the 1st of June at North Shields; on the 15th at Oxford; on the 21st at Oxford; on the 27th at Oxford; on the 30th at Strathfield Turgiss.

Lunar halos were seen on 12 nights during the quarter.

Auroræ Boreales were seen on 9 days in April, on 6 days in May, and on 3 days in June.

Snow fell on 14 days during the quarter, mostly in the North.

Hail fell on 14 occasions in April, on 16 in May, and on 10 in June.

Fog was prevalent at some place on 10 days in April, 6 in May, and 10 in June.

Field Elm in leaf on the 2d of April at Brighton; on the 15th at Hull; on the 20th at Miltown; and on the 27th at Helston.

Wych Elm in leaf on the 6th of April at Chislehurst; on the 15th at Hull; on the 19th at Wisbech; and on the 21st at Somerleyton.

Oak in leaf on the 25th of April at Guernsey; on the 27th at Osborne; and on the 29th at Culloden and Chislehurst. On the 1st of May at Oxford; on the 3d at Wisbech; on the 10th at Strathfield Turgiss; on the 15th at Cockermouth; and on the 16th at Brighton. On the 6th of June at Hull.

Lime in leaf on the 7th of April at Wisbech; on the 8th at Llandudno; on the 13th at Strathfield Turgiss; on the 14th at Chislehurst; on the 15th at Culloden; on the 16th at Guernsey; on the 17th at Somerleyton; and on the 25th at Osborne. On the 2d of May at Brighton; and on the 3d at Hull.

Sycamore in leaf on the 8th of April at Llandudno; on the 13th at Brighton; on the 19th at Helston; on the 23d at Wisbech; and on the 30th at Miltown. On the 4th of May at Strathfield Turgiss; and on the 10th at Hull.

Horse Chestnut in leaf on the 7th of April at Guernsey, on the 9th at Wisbech; on the 13th at Osborne and Brighton; on the 14th at Chislehurst; on the 17th at Helston; on the 22d at Miltown; and on the 28th at Carlisle. On the 10th of May at Hull.

Common Poplar in leaf on the 9th of April at Wisbech; and on the 14th at Helston and Chislehurst. On the 6th of June at Hull.

Hawthorn in leaf on the 1st of April at Miltown; and on the 24th at Carlisle. On the 12th of May at Culloden. In blossom on the 29th of April at Helston.

Hazel in leaf on the 4th of April at Strathfield Turgiss; and on the 5th at Miltown.

Beech in leaf on the 14th of April at Brighton; on the 24th at Culloden; and on the 26th at Osborne.

Apple in blossom on the 1st of April at Llandudno; on the 2d at Wisbech; on the 10th at Hull; on the 12th at Wisbech; on the 13th at Brighton; on the 15th at Miltown; and on the 28th at North Shields. On the 2d of May at Stonyhurst.

Hardy Pear in blossom on the 6th of April at Wisbech; on the 8th at Miltown; on the 10th at Hull; on the 26th at North Shields; and on the 28th at Carlisle.

Cherry in blossom on the 3d of April at Silloth; on the 4th at Miltown; on the 12th at Hull; on the 18th at Carlisle; and on the 27th at North Shields.

Wild Cherry in blossom on the 13th of April at Brighton.

Cherry ripe on the 10th of May at Weybridge.

Plum in blossom on the 1st of April at Miltown; on the 3d at Wisbech; on the 11th at Hull; and on the 18th at Carlisle.

Lilac in blossom on the 12th of April at Helston; on the 14th at Guernsey; on the 17th at Osborne and Llandudno; on the 23d at Strathfield Turgiss, Chislehurst, and Wisbech; on the 24th at Weybridge; and on the 25th at Lampeter. On the 1st of May at Hawarden; on the 4th at Silloth; on the 6th at Miltown; on the 8th at Cockermouth and Carlisle; on the 9th at Hull; on the 10th at Culloden; and on the 21st at North Shields.

Laburnum in blossom on the 16th of April at Guernsey; on the 20th at Helston; on the 28th at Llandudno; on the 29th at Brighton, Weybridge, and Wisbech; and on the 30th at Oxford. On the 1st of May at Hawarden; on the 4th at Silloth; on the 6th at Chislehurst; on the 8th at Weybridge; on the 10th at Hull; on the 13th at Carlisle; and on the 17th at Strathfield Turgiss and Miltown; and on the 24th at North Shields.

Yellow broom in blossom on the 11th of April at Weybridge; on the 17th at Hull; and on the 28th at Miltown. On the 27th of June at Brighton.

White broom in blossom on the 17th of April at Weybridge. On the 8th of May at Chislehurst, Hull, and Miltown.

Mountain ash in blossom on the 27th of April at Weybridge. On the 2d of May at Strathfield Turgiss; on the 8th at Chislehurst; on the 10th at Hull; on the 15th at Miltown; on the 20th at North Shields; and on the 22d at Cockermouth.

Honeysuckle in blossom on the 16th of April at Helston; on the 29th at Chislehurst. On the 18th of June at Hull.

Privet in blossom on the 4th of June at Weybridge; on the 18th at Chislehurst; on the 22d at Strathfield Turgiss; and on the 30th at Hull.

Syringa in blossom on the 17th of May at Weybridge; on the 20th at Chislehurst; and on the 30th at Strathfield Turgiss.

Acacia in blossom on the 18th of June at Chislehurst.

Wheat in ear on the 17th of June at Cardington; on the 19th at Hull; on the 20th at Llandudno; on the 21st at Helston, Hawarden, and Cockermouth. *In flower* on the 20th of June at Chislehurst; on the 21st at Silloth; on the 24th at Taunton and Weybridge; on the 27th at Cardington; on the 28th at Hawarden; and on the 30th at Helston.

Barley in flower on the 20th of June at Llandudno.

Rye in flower on the 7th of June at Chislehurst.

Oats in flower on the 30th of June at Weybridge.

Cuckoo arrived on the 7th of April at Guernsey; on the 11th at Somerleyton; on the 12th at Osborne; on the 13th at Helston and (near) Brighton; on the 14th at Taunton; on the 15th at South Hill (near) Cardington; on the 18th at Lymington; on the 20th at Weybridge; on the 22d at Truro, Cardington, and Hawarden; on the 24th at Streatley; on the 25th at Llandudno and Miltown; on the 26th at Stonyhurst; on the 27th at Royston, Allenheads, and Silloth; on the 28th at Oxford, Lampeter, Wisbech, and Hull; on the 30th at Carlisle. *Departed* on the 28th of June from Silloth.

Swallow arrived on the 1st of April at Miltown; on the 11th at Helston; on the 14th at Weybridge and Silloth; on the 18th at Cardington; on the 22d at Carlisle; on the 24th at Truro; on the 25th at Hawarden; on the 27th at Royston, Wisbech, and Hull; on the 29th at Brighton and Oxford.

Nightingale arrived on the 11th of April at Lymington; on the 13th at Osborne, and (near) *Brighton; on the 17th at Weybridge*, Streatley, and Cardington; and on the 22d at Somerleyton. *Departed on the 10th of June* from Weybridge.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING JUNE 30TH, 1872.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1872. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, SAMUEL ELLIOTT HOSKINS, ESQ., M.D., F.R.S.	204	April	29·704	1·473	60·0	39·0	21·0	53·7	44·0	9·7	48·0	41·9	·265	3·0	0·8	80	542	—	—	1·4	9	7	6	8	4·8	4·2	11	2·33
		May	29·732	0·935	61·0	40·0	21·0	55·3	45·4	9·9	49·5	43·7	·285	3·2	0·7	81	541	—	—	1·2	10	4	6	11	5·7	4·6	15	4·05
		June	29·741	0·800	78·0	45·5	32·5	62·1	51·4	10·7	55·8	50·8	·373	4·2	0·8	84	534	—	—	1·3	7	4	8	11	5·3	4·9	17	3·13
HELSTON (Cornwall), MATTHEW P. MOYLE, ESQ., M.R.C.S.	106	April	29·911	1·621	70·0	34·0	36·0	59·0	43·9	15·1	50·1	44·3	·292	3·5	0·8	81	541	81·9	37·7	1·8	9	6	7	8	5·4	4·3	13	3·61
		May	29·947	0·931	68·0	36·0	32·0	60·9	46·1	14·8	52·5	42·4	·275	3·3	1·3	70	538	86·3	41·8	2·2	12	2	5	12	4·7	3·8	16	2·49
		June	29·894	0·935	80·0	46·0	34·0	65·7	52·6	13·1	58·2	48·3	·340	3·8	1·5	69	534	96·1	46·3	2·0	5	2	8	15	5·0	4·3	13	2·55
TRURO (Cornwall), C. BARHAM, ESQ., M.D., F.M.S.	43	April	29·885	1·573	66·0	30·0	36·0	56·0	40·6	15·4	46·4	41·5	·262	3·1	0·6	84	547	—	—	2·8	13	2	9	6	—	5·8	12	2·77
		May	29·940	0·913	67·0	32·0	35·0	58·3	43·0	15·3	49·5	43·9	·287	3·2	1·0	82	544	—	—	2·6	13	3	2	13	—	6·2	19	2·79
		June	29·921	0·902	80·0	41·0	39·0	64·7	50·7	14·0	55·3	48·3	·340	3·8	1·2	77	538	—	—	2·5	8	4	5	13	—	6·7	16	2·77
SIDMOUTH (Devon), J. INGLEBY MACKENZIE, ESQ., M.B., F.M.S.	30	April	29·900	1·456	61·0	29·7	31·3	54·2	42·0	12·2	47·1	43·3	·280	3·3	0·4	87	546	—	—	1·2	6	6	7	11	—	2·6	11	1·92
		May	29·923	0·971	66·5	34·7	31·8	57·1	43·1	14·0	49·0	44·6	·296	3·4	0·6	85	546	—	—	1·4	6	4	3	18	—	3·4	17	1·58
		June	29·921	0·953	74·2	43·3	30·9	62·9	50·1	12·8	55·6	52·1	·383	4·3	0·7	87	537	—	—	1·6	6	0	9	15	—	3·7	18	3·61
OSBORNE (Isle of Wight), J. R. MANN, ESQ.	172	April	29·742	1·453	69·8	30·9	38·9	58·6	39·5	19·1	47·6	41·8	·265	3·0	0·7	81	546	94·2	36·6	0·5	7	6	8	9	—	5·1	11	1·05
		May	29·747	0·944	73·8	33·6	40·2	61·3	42·7	18·6	50·5	44·1	·289	3·4	0·8	79	540	100·5	40·7	0·3	8	4	7	12	—	5·8	20	2·28
		June	29·748	0·859	82·7	36·4	46·3	68·4	49·7	18·7	57·3	52·2	·391	4·4	0·9	83	532	106·7	48,6	0·3	3	5	11	11	—	6·4	17	2·40
PORTSMOUTH, WILLIAM C. ELLIS, ESQ., F.M.S.	16	Mar.	29·815	1·039	58·0	21·8	36·2	52·2	37·6	14·6	44·6	39·6	·245	2·8	0·5	83	548	88·2	33·9	1·2	6	6	11	8	2·2	6·0	12	1·78
		April	29·924	1·540	67·6	30·4	37·2	58·0	38·5	19·5	47·1	39·5	·242	2·8	0·9	75	547	102·8	34·6	1·1	7	5	10	8	1·9	5·5	13	1·24
		May	29·928	0·947	72·4	32·0	40·4	61·2	41·1	20·1	50·0	41·6	·264	3·0	1·1	73	544	109·3	38·2	1·3	5	4	10	12	2·8	5·7	15	2·30
		June	29·928	0·874	79·0	38·4	40·6	67·9	47·7	20·2	56·4	49·3	·355	4·0	1·1	77	537	115·6	43·3	2·0	0	2	14	14	3·4	6·6	13	2·21
WORTHING (Sussex), W. J. HARRIS, ESQ. M.R.C.S.E., L.S.A.	31	April	29·871	1·482	61·3	34·1	27·2	55·8	42·5	13·3	47·9	41·7	·262	3·0	0·8	80	545	116·6	37·5	1·0	7	5	8	10	4·6	4·6	9	0·51
		May	29·880	0·956	68·0	35·2	32·8	57·9	[illegible]	12·9	50·5	43·7	·286	3·2	0·9	78	543	121·4	39·7	1·0	7	6	4	14	4·6	5·1	15	2·86
		June	29·879	0·823	72·9	40·4	32·5	64·7	[illegible]	12·9	57·1	51·0	·367	4·1	1·1	80	535	130·3	47·4	1·3	2	2	11	15	5·2	5·5	13	2·15
BRIGHTON (Sussex), FREDERICK E. SAWYER, ESQ., F.M.S.	200	April	29·704	1·491	62·7	33·6	29·1	54·9	42·4	[illegible]	47·4	42·2	·268	3·1	0·6	83	542	105·4	37·4	1·1	9	6	7	8	2·3	5·6	9	0·71
		May	29·705	0·933	71·5	32·0	39·5	59·1	45·0	14·1	50·4	45·3	·303	3·5	0·7	83	539	105·5	40·9	1·2	5	4	6	16	1·9	5·9	19	2·67
		June	29·717	0·806	78·0	42·6	35·4	67·7	52·4	[illegible]	58·1	52·8	·400	4·5	0·9	82	531	115·6	50·2	1·4	2	2	16	10	0·4	5·8	13	2·34
LYMINGTON (Hants), GEORGE J. JONES, ESQ.	77	April	29·839	1·358	66·9	29·8	37·1	57·9	40·4	17·5	48·8	40·5	·253	2·9	1·0	73	544	—	—	1·0	9	6	10	5	—	3·7	8	1·34
		May	29·851	0·941	71·3	31·6	39·7	59·7	42·9	16·8	[illegible]	41·7	·264	3·0	1·2	71	541	—	—	0·8	9	5	6	11	—	5·8	16	3·01
		June	29·837	0·846	82·6	36·7	45·9	67·0	49·1	17·9	[illegible]	48·9	·347	3·8	1·5	72	534	—	—	0·2	3	2	11	14	—	5·2	14	2·80
TAUNTON (Somerset), REV. W. TUCKWELL, F.M.S.	80	April	29·885	1·570	69·9	26·9	43·0	56·8	38·3	18·5	[illegible]	43·1	·279	3·3	0·4	86	547	72·1	37·4	0·2	10	5	5	11	7·0	3·5	11	3·64
		May	29·857	1·085	73·2	32·2	41·0	60·5	42·0	18·5	[illegible]	44·7	·297	3·3	0·7	82	543	76·1	39·3	0·3	10	5	0	16	7·0	5·8	10	2·86
		June	29·844	1·124	84·2	36·1	48·1	68·2	47·7	20·5	[illegible]	51·4	·380	4·3	0·8	84	535	81·3	45·2	0·2	3	1	18	13	7·5	6·0	17	3·29
WILTON HOUSE (near Salisbury), T. CHALLIS, ESQ.	186	April	29·718	1·422	69·7	24·2	45·5	59·6	37·2	22·4	48·5	39·4	·244	2·8	1·2	69	541	102·5	34·4	1·2	8	5	9	8	4·6	5·0	11	2·22
		May	29·716	0·977	76·7	29·7	47·0	62·6	40·2	[illegible]	50·5	46·8	·321	3·7	0·5	88	539	107·2	38·5	1·3	11	4	6	10	4·6	6·4	16	2·51
		June	29·710	0·889	88·5	33·5	55·0	70·4	47·1	[illegible]	57·5	54·8	·450	4·7	0·6	91	531	114·9	45·3	1·4	7	0	14	9	5·1	6·3	17	3·50
BARNSTAPLE (Devon), T. MACKRELL, ESQ.	40	April	29·878	1·460	67·5	32·0	35·5	56·6	41·1	15·5	48·0	41·7	·263	3·0	0·8	79	545	—	—	1·2	6	4	10	10	—	4·1	13	2·68
		May	29·878	0·981	68·5	36·0	32·5	60·5	[illegible]	15·3	51·4	45·5	·306	3·5	0·8	81	541	—	—	1·1	4	2	8	13	—	2·5	12	1·22
		June	29·857	1·023	79·0	41·0	38·0	66·0	[illegible]	14·4	57·5	52·2	·391	4·2	0·9	83	534	—	—	1·3	5	2	12	12	—	4·9	10	2·32

	feet		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
ALDERSHOT CAMP (Hants), JOHN ARNOLD, ESQ., M.S.C., F.M.S.	325	April	29·545	1·296	69·8	31·4	38·4	58·7	39·3	19·4	47·3	40·3	·250	2·9	0·9	77	540	105·7	37·5	1·6	9	4	7	10	2·8	5·5	15	1·58
		May	29·553	0·974	73·2	32·0	41·2	61·5	43·4	18·1	50·5	42·5	·278	3·1	1·0	74	536	113·9	40·9	1·4	8	4	7	12	2·5	6·9	15	2·68
		June	29·549	0·868	85·4	40·8	44·6	70·8	50·3	20·5	58·7	51·3	·358	4·2	1·2	76	527	117·7	47·7	1·5	3	3	12	12	2·4	7·1	18	2·80
STRATHFIELD TURGISS (Hants), REV. C. H. GRIFFITH, M.A., F.M.S.	197	April	29·726	1·327	69·2	24·9	44·3	55·9	36·6	21·3	47·1	39·7	·244	2·8	0·9	79	543	109·9	31·5	1·1	9	5	7	8	5·1	5·2	16	2·08
		May	29·696	0·977	73·3	29·0	44·3	61·6	40·8	20·8	49·8	42·2	·269	3·1	1·0	75	540	114·9	35·8	0·8	8	6	5	12	4·8	6·0	19	2·67
		June	29·707	0·896	88·2	34·1	54·1	70·3	47·3	23·0	57·5	50·8	·371	4·2	1·0	79	531	124·4	45·2	0·9	4	3	11	12	5·1	6·0	14	2·26
WEYBRIDGE HEATH (Surrey), WILLIAM F. HARRISON, ESQ., F.M.S.	150	April	29·790	1·361	72·0	26·5	45·5	59·7	38·3	21·4	48·1	40·6	·252	2·9	0·9	75	543	98·8	35·0	0·9	11	4	11	4	1·8	4·8	14	1·10
		May	29·792	0·939	73·5	30·5	48·0	62·4	41·0	21·4	50·6	44·5	·294	3·5	0·8	80	541	104·8	38·6	0·6	8	4	10	6	2·3	6·0	20	3·38
		June	29·788	0·828	88·8	37·3	51·5	71·9	47·5	24·4	58·6	50·7	·380	4·2	1·4	75	532	114·1	45·5	0·6	4	5	12	9	1·7	4·5	14	2·39
MARLBOROUGH COLLEGE (Wilts) REV. THOMAS A. PRESTON, M.A.	456	April	29·432	1·379	67·6	23·4	44·2	54·9	37·3	17·6	45·1	38·8	·236	2·7	0·7	79	540	113·5	30·7	–	10	6	5	9	3·7	6·3	13	2·00
		May	29·457	0·986	68·8	29·2	39·6	56·9	40·5	16·4	47·4	40·4	·251	2·9	0·9	77	538	123·8	35·0	–	10	5	3	13	3·9	7·5	18	2·30
		June	29·437	0·946	81·7	36·1	45·6	65·3	47·4	17·9	54·8	49·1	·349	4·0	0·9	81	529	130·8	40·8	–	6	0	9	15	2·1	7·2	17	3·41
CHISLEHURST (Heathfield Lodge, Kent), FRANCIS NUNES, ESQ., M.A., F.M.S.	295	April	29·558	1·335	73·3	25·5	47·8	59·9	38·7	21·2	47·8	39·8	·245	2·8	1·0	74	546	111·7	33·4	–	9	5	7	9	–	–	15	1·22
		May	29·572	0·951	76·4	32·0	44·4	62·9	41·4	21·5	50·6	43·0	·278	3·2	1·0	76	543	118·6	36·2	–	7	5	6	13	–	–	18	3·77
		June	29·570	0·827	89·8	37·8	52·0	73·5	48·7	24·8	59·3	52·5	·396	4·4	1·2	78	527	128·7	44·3	–	5	2	10	13	–	–	15	1·76
ROYAL OBSERVATORY (Kent), THE ASTRONOMER ROYAL.	159	April	29·735	1·357	69·9	29·6	40·3	59·3	40·1	19·2	48·3	41·0	·257	2·9	0·9	76	542	133·7	21·3	0·4	9	6	7	8	–	5·6	13	0·98
		May	29·736	1·083	73·2	32·6	40·6	62·1	42·5	19·6	50·9	43·6	·284	3·3	0·9	76	539	144·7	25·8	0·3	9	5	6	11	–	6·9	15	3·09
		June	29·735	0·836	86·0	40·6	45·4	71·3	50·0	21·3	59·2	51·1	·375	4·2	1·4	75	530	128·7	43·9	0·4	3	3	10	14	–	6·5	15	1·64
THE GUILDHALL (London), WILLIAM HAYWOOD, ESQ.		April	29·686	1·285	68·2	37·0	31·2	57·3	44·5	12·8	50·1	40·7	·256	2·9	1·2	69	540	–	–	–	–	–	–	–	–	–	–	–
		May	29·661	1·004	70·0	38·0	32·0	60·3	48·5	11·8	53·4	42·5	·272	3·1	1·5	67	535	–	–	–	–	–	–	–	–	–	15	2·85
STREATLEY VICARAGE (Berks), REV. J. SLATTER, M.A., F.R.A.S.	150	April	29·809	1·470	70·9	27·5	43·4	59·2	38·0	21·2	48·1	39·6	·243	2·8	1·0	73	544	69·1	32·7	1·8	11	4	5	10	–	5·1	14	1·87
		May	29·795	0·988	74·0	31·6	42·4	61·7	42·0	19·7	51·0	44·4	·291	3·4	0·9	78	540	72·6	36·6	2·0	8	6	5	12	–	6·2	17	2·28
		June	29·763	0·954	86·4	37·8	48·6	70·4	47·4	23·0	58·5	49·7	·359	4·0	1·5	78	531	81·5	–	2·3	5	0	10	15	–	6·1	17	2·43
ST. JOHN'S COLLEGE, BATTERSEA, REV. J. P. FAUNTHORPE, B.A., F.R.G.S.	13	April	29·852	1·365	68·0	27·0	41·0	57·7	38·1	19·6	47·1	42·0	·267	3·1	0·6	83	545	84·3	35·9	1·7	2	2	16	10	–	6·0	14	1·32
		May	29·876	1·006	70·4	31·7	38·7	59·6	40·4	19·2	49·3	44·9	·299	3·5	0·7	88	544	92·6	38·8	1·8	0	2	17	12	–	6·6	15	3·63
		June	29·843	1·772	85·0	38·0	47·0	68·6	48·5	20·1	57·5	52·7	·399	4·4	0·9	84	533	109·2	46·6	1·6	0	0	20	10	–	6·5	13	2·34
MARYLEBONE (London), HENRY E. SEGRAVE, ESQ., F.M.S.	146	April	–	1·414	71·0	30·0	41·0	59·2	39·8	19·4	48·4	40·7	·254	2·9	1·0	75	545	–	–	0·4	10	1	8	11	–	5·8	17	1·55
		May	–	0·951	75·2	31·0	44·2	61·7	42·3	19·4	50·7	42·3	·271	3·1	1·0	75	543	–	–	0·5	9	5	6	11	–	6·5	20	3·74
		June	–	0·851	85·7	39·0	46·7	71·2	50·1	21·1	59·2	48·9	·347	3·9	1·8	69	533	–	–	–	4	1	11	14	–	5·8	15	3·01
CAMDEN TOWN (London), G. J. SYMONS, ESQ., F.M.S.	123	April	29·782	1·355	70·2	29·4	40·8	60·1	40·4	19·7	49·3	51·4	·262	3·0	1·0	75	542	98·2	36·8	–	11	4	8	7	–	5·2	16	1·39
		May	29·784	0·991	75·9	33·2	42·7	62·9	43·6	19·3	51·9	44·1	·289	3·3	1·1	75	539	108·5	40·5	–	6	3	8	14	–	6·3	18	3·05
		June	29·778	0·865	85·9	40·6	45·3	71·7	50·1	21·6	59·2	49·3	·350	3·9	1·7	70	521	114·9	48·2	–	2	2	10	16	–	5·4	15	2·55
OXFORD (Oxfordshire), REV. R. MAIN, M.A., F.R.S., F.R.A.S.	210	April	29·690	1·379	67·8	28·6	39·2	57·1	40·0	17·1	47·3	39·7	·244	2·8	1·0	75	543	109·0	33·5	1·2	9	4	7	10	2·2	7·0	13	1·85
		May	29·684	1·014	71·6	31·6	40·6	59·4	42·7	16·7	50·0	41·8	·265	3·0	1·0	74	543	111·3	34·5	1·0	9	2	7	13	2·7	8·0	19	2·55
		June	29·664	0·935	85·4	37·8	47·6	68·7	50·3	18·4	58·0	50·8	·372	4·2	1·2	77	533	118·1	41·5	1·1	9	1	15	12	2·0	7·7	15	2·59
GLOUCESTER (Gloucester), E. TOLLER, ESQ., M.D.	100	April	29·857	1·387	72·3	31·7	40·6	58·6	38·9	19·7	48·6	40·1	·269	3·1	0·8	79	545	108·7	39·4	0·9	9	5	6	10	2·5	5·3	15	2·95
		May	29·844	1·033	75·2	31·5	43·7	63·5	43·2	20·3	50·3	41·5	·262	3·0	1·0	72	544	111·6	45·4	0·8	9	5	5	12	1·6	6·9	16	1·24
		June	29·838	1·012	89·0	37·0	52·0	70·6	50·3	20·3	57·6	49·2	·352	3·9	1·1	73	534	116·3	50·9	0·7	5	2	8	15	3·4	6·8	18	4·07
ROYSTON (Hertfordshire), HALE WORTHAM, ESQ., F.R.A.S., F.M.S.	260	April	29·618	1·352	74·8	26·8	48·0	59·2	38·3	20·9	47·4	39·8	·245	2·9	0·9	76	541	–	–	–	8	3	10	9	–	5·3	15	1·81
		May	29·648	0·995	77·8	31·3	46·5	63·1	41·0	22·1	49·8	43·8	·286	3·3	0·8	80	539	–	–	–	9	2	6	14	–	6·6	19	2·75
		June	29·647	0·890	88·0	38·6	49·4	71·2	48·4	22·8	57·8	51·2	·376	4·2	1·1	79	530	–	–	–	0	2	13	15	–	6·6	17	2·70
CARDINGTON (near Bedford), MR. MACLAREN, Assistant to S. C. WHITBREAD, ESQ., F.R.S.	100	April	29·806	1·380	72·0	26·0	46·0	58·3	38·7	19·6	48·0	42·8	·273	3·2	0·6	83	544	81·8	31·1	0·9	11	6	7	6	–	6·0	13	1·90
		May	29·814	1·041	74·0	31·0	43·0	62·4	42·0	20·4	50·7	45·0	·300	3·4	0·7	80	541	97·4	35·8	1·0	10	1	6	14	–	6·8	13	2·48
		June	29·771	0·917	86·0	37·0	49·0	71·8	48·8	23·0	59·2	51·4	·381	4·3	1·4	76	531	103·0	44·0	0·9	4	2	13	11	–	5·5	14	2·30
ST. DAVID'S COLLEGE, LAMPETER (Cardiganshire), PROF. A. W. SCOTT.	420	Mar	29·299	1·085	66·0	25·5	40·5	54·5	36·6	17·9	44·2	38·3	·232	2·6	0·6	80	546	82·8	–	–	4	6	13	7	–	–	23	3·98
		April	29·522	1·356	64·5	28·0	38·5	58·3	34·7	23·6	46·8	37·7	·226	2·6	1·0	71	540	105·2	–	–	6	4	13	7	–	–	12	2·42
LEAMINGTON (Warwickshire), S. URWICK JONES, ESQ., F.M.S.	195	April	29·698	1·329	68·0	31·2	36·8	57·5	39·7	17·8	47·4	37·6	·243	2·8	0·9	75	542	–	–	2·3	8	6	5	11	–	5·5	14	1·80
		May	29·703	1·023	71·3	31·5	39·8	59·9	42·7	17·2	49·9	41·9	·267	3·2	0·8	84	540	–	–	0·8	7	5	5	14	–	7·6	16	1·36
		June	29·648	0·909	84·6	36·7	47·9	68·9	49·5	19·4	58·0	48·5	·342	3·8	1·6	71	530	–	–	0·8	5	2	9	14	–	6·8	18	4·04

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1872. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean. Of all Highest.	Temperature of Air in Month. Mean. Of all Lowest.	Temperature of Air in Month. Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	April	29·837	1·337	67·3	27·2	40·1	57·2	38·9	18·3	46·7	43·9	·280	3·2	0·5	91	546	103·4	29·5	1·0	6	9	8	7	7·3	4·8	13	2·45
		May	29·839	1·090	73·4	32·0	41·4	60·6	41·4	19·2	49·5	44·9	·299	3·5	0·5	87	543	107·0	33·1	1·0	6	10	8	7	6·9	4·8	18	2·60
		June	29·840	0·894	82·3	41·3	41·0	68·4	49·6	18·8	57·3	52·4	·387	4·4	0·9	83	534	112·8	41·7	1·0	3	7	9	11	6·4	4·6	14	2·35
NORWICH (Norfolk), C. M. Gibson, Esq., F.M.S.	42	April	29·845	1·326	68·0	27·0	41·0	56·6	38·6	18·0	46·6	41·0	·258	3·0	0·7	82	546	—	—	—	8	5	9	8	—	—	10	2·13
		May	29·844	1·092	74·0	33·0	41·0	60·9	41·3	19·6	49·9	43·7	·286	3·3	0·8	80	542	—	—	—	9	4	9	9	—	—	15	1·74
		June	29·843	0·843	82·5	40·0	42·5	69·2	49·2	20·0	57·9	51·0	·374	4·2	1·2	78	535	—	—	—	4	3	10	13	—	—	18	2·46
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	April	29·871	[illegible]	72·8	30·2	42·6	58·4	39·4	19·0	48·2	42·3	[illegible]	3·1	0·9	81	545	109·8	35·8	0·7	7	6	8	9	3·0	5·9	16	4·03
		May	29·871	1·089	73·1	32·2	40·9	62·0	42·4	19·6	51·2	44·7	·297	3·4	0·9	79	541	114·4	39·0	0·6	7	4	8	12	3·3	6·5	17	2·15
		June	29·835	0·902	84·0	38·1	45·9	70·2	49·6	20·6	58·4	52·9	·397	4·5	0·9	82	533	121·1	46·3	0·6	2	6	12	10	3·6	5·6	15	2·98
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	April	29·811	1·312	67·2	32·5	34·7	56·4	41·7	14·7	48·0	40·0	·247	2·8	1·0	74	544	—	—	0·6	9	6	4	11	—	5·9	9	2·18
		May	29·778	1·139	68·2	35·3	32·9	59·3	44·4	14·9	51·4	43·0	·278	3·2	1·0	77	541	—	—	0·7	8	4	3	16	—	7·5	17	2·02
		June	29·751	1·041	78·7	39·8	38·9	66·3	50·0	16·3	56·3	49·9	·361	4·0	1·0	79	533	—	—	0·5	2	0	6	22	—	6·8	24	5·20
DERBY (Derbyshire), John Davis, Esq.	174	April	29·694	1·332	70·0	31·0	39·0	56·4	40·0	16·4	46·5	41·5	·267	3·0	0·7	89	545	—	—	—	9	5	5	11	—	—	14	2·24
		May	29·690	1·071	71·0	32·0	39·0	59·6	42·8	16·8	49·1	44·7	·298	3·4	0·6	86	543	—	—	—	8	4	5	14	—	—	16	1·63
		June	29·651	0·981	84·0	37·0	47·0	67·9	49·6	18·3	54·4	52·1	·391	4·4	0·6	86	531	—	—	—	3	1	12	14	—	—	18	5·27
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	241	April	29·620	1·244	71·6	32·3	39·3	56·1	37·3	18·8	47·1	40·7	·254	2·9	0·8	79	541	105·4	28·4	0·7	6	6	6	12	3·1	5·6	15	2·70
		May	29·624	1·072	74·4	29·5	44·9	61·7	41·0	20·7	50·0	43·3	·279	3·2	0·9	78	538	115·8	31·4	0·5	4	5	9	13	2·3	7·2	15	1·68
		June	29·591	0·875	86·1	37·2	48·9	71·4	48·6	22·8	58·5	49·4	·354	3·9	1·6	72	528	124·2	39·2	0·4	0	2	12	16	3·1	5·9	17	2·93
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	April	29·839	1·257	71·6	24·8	44·8	55·9	39·2	16·7	46·8	39·6	·244	2·9	0·8	77	546	117·2	34·3	1·3	8	6	11	5	—	5·7	6	2·60
		May	29·831	1·112	68·2	31·0	37·2	59·0	40·9	18·1	49·2	41·3	·261	2·9	1·1	74	543	124·5	36·7	1·3	12	3	9	7	—	6·2	12	1·60
HAWARDEN (Flint), T. Moffat, Esq., M.D., F.R.A.S.	270	April	29·611	1·304	66·5	34·0	32·5	55·2	48·1	7·1	47·4	42·8	·275	3·2	0·5	86	541	101·7	21·9	2·4	10	4	8	8	1·7	6·1	15	3·40
		May	29·622	1·134	68·5	35·5	33·0	56·6	45·6	11·0	49·0	41·1	·259	2·9	0·9	74	539	120·2	23·6	2·0	11	4	3	13	1·1	5·1	20	1·93
		June	29·576	1·098	80·0	39·0	41·0	64·0	53·5	10·5	56·8	52·2	·391	4·3	0·8	84	530	124·5	31·0	2·4	6	2	11	11	1·0	7·0	24	4·63
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	April	29·750	1·254	67·2	33·5	33·7	54·0	41·1	12·9	46·4	40·0	·248	2·9	0·7	80	545	—	—	1·3	6	7	5	12	—	6·0	12	2·69
		May	29·708	1·090	68·0	34·8	33·2	57·1	44·0	13·1	49·1	41·6	·264	3·0	1·0	76	541	—	—	1·2	5	6	4	16	—	6·3	20	1·50
		June	29·654	1·077	80·7	38·1	42·6	63·9	50·4	13·5	53·6	49·9	·262	4·0	0·9	82	532	—	—	1·2	2	5	9	14	—	6·7	22	4·31
ECCLES, near Manchester, T. Mackereth, Esq., F.R.A.S., F.M.S.	145	April	29·748	1·292	69·5	30·0	39·5	55·4	38·4	17·0	46·3	39·1	·239	2·8	0·9	77	545	67·6	20·6	0·6	7	5	8	10	3·7	3·8	14	3·00
		May	29·738	1·126	71·5	30·0	41·5	57·5	41·1	16·4	48·6	41·5	·262	3·0	0·9	77	542	70·6	33·4	0·3	10	3	4	14	2·7	6·1	23	2·55
		June	29·691	0·976	82·5	33·3	49·2	65·9	48·5	17·4	56·0	48·8	·345	3·9	1·1	77	533	81·3	40·7	0·3	6	3	8	13	2·6	5·7	24	5·40
MOOR SIDE OBSERVATORY, HALIFAX (Yorkshire), Louis J. Crossley, Esq., F.M.S.	437	April	29·340	1·246	67·5	28·5	39·0	53·6	36·9	16·7	43·9	38·9	·238	2·8	0·5	83	540	100·0	32·9	—	9	5	5	11	3·7	7·1	16	3·79
		May	29·331	1·101	67·6	28·1	39·5	56·5	36·8	19·7	45·6	40·8	·254	3·0	0·6	84	538	107·0	34·5	1·3	8	5	6	12	1·8	7·7	18	2·18
		June	29·257	1·024	82·8	37·0	45·8	66·5	47·1	19·4	54·5	49·1	·349	3·9	0·9	81	527	116·8	43·0	1·0	6	5	6	13	3·3	8·1	21	4·53
PARK ROAD OBSERVATORY (Halifax, Yorkshire), Edward Crossley, Esq., F.R.A.S.	618	April	29·229	1·207	64·0	28·0	38·0	52·7	37·2	15·5	42·7	36·7	·218	2·5	0·6	80	539	99·6	33·1	0·5	7	7	5	11	—	6·5	12	4·46
		May	29·236	1·090	67·5	32·4	35·1	56·3	40·3	16·0	47·1	40·7	·252	2·9	0·8	79	534	94·0	35·7	—	—	—	—	—	—	6·8	13	2·94
		June	29·168	1·036	82·0	37·0	45·0	61·9	43·4	18·5	53·8	44·9	·206	3·4	1·2	72	526	107·5	42·8	0·4	4	4	6	16	—	7·5	21	6·35
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	April	29·873	1·236	69·0	28·0	41·0	55·4	38·5	16·9	45·5	40·5	·255	2·9	0·6	84	548	82·2	33·4	—	—	—	—	—	5·0	—	14	2·59
		May	29·870	1·142	73·0	30·0	43·0	60·1	40·0	20·1	49·0	43·2	·280	3·2	0·8	80	544	90·0	36·5	—	—	—	—	—	2·9	—	14	1·71
		June	29·840	0·996	81·0	40·0	41·0	68·8	48·4	20·4	56·6	51·0	·375	4·2	0·9	81	535	99·9	45·8	—	—	—	—	—	2·5	—	14	2·18
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	381	April	29·477	1·242	65·4	30·2	35·2	54·5	39·0	15·5	45·8	39·8	·240	2·8	0·6	80	541	110·6	34·3	—	7	6	6	11	—	6·4	20	3·68
		May	29·445	1·190	67·0	32·7	34·3	56·7	42·1	14·6	47·8	42·0	·264	3·2	0·7	82	[illegible]	115·5	37·0	—	6	6	2	20	—	7·9	23	3·29
		June	[illegible]	[illegible]	81·5	34·7	46·8	65·2	49·5	15·7	55·0	50·7	·309	4·2	0·8	[illegible]	[illegible]	121·9	40·4	—	1	2	7	20	—	8·0	25	5·04

NOTE.—The Barometer Reading, June 29, p.m., The Park, Hull, [illegible] in., has been altered to [illegible] in.

	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	April	29·442	1·180	66·0	33·0	54·0	55·5	40·3	15·2	46·4	38·3	·332	2·6	1·0	74	539	81·0	—	1·1	—	—	—	—	—	5·0	13	4·75
		May	29·540	0·989	69·0	35·0	34·0	59·2	45·0	14·2	50·7	40·4	·252	2·9	1·6	68	536	84·4	—	1·3	—	—	—	—	—	5·6	11	1·09
		June	29·412	0·800	83·2	41·4	41·8	68·4	51·3	17·1	58·0	48·9	·347	3·9	1·5	72	526	91·5	—	1·0	—	—	—	—	—	6·0	15	5·32
LEEDS PHILOSOPHICAL HALL (Yorkshire). Louis C. Miall, Esq.	137	April	29·740	1·244	72·0	31·0	41·0	57·3	39·0	18·3	46·9	39·6	·245	2·9	0·7	78	544	—	—	1·7	8	5	7	10	—	8·1	16	5·33
		May	29·734	1·130	74·0	31·0	43·0	61·0	41·6	19·4	49·9	43·3	·281	3·2	0·8	79	540	—	—	1·5	6	6	4	15	—	7·8	11	1·27
		June	29·685	1·051	89·0	38·0	51·0	70·5	49·4	21·1	58·0	49·8	·357	4·0	1·4	74	531	80·0	—	1·3	5	1	10	14	—	8·1	19	4·56
YORK (Yorkshire), J. F. Fryer, Esq.	50	April	29·795	1·245	67·5	30·0	37·5	53·0	39·8	13·2	46·0	42·4	·272	3·2	0·4	88	546	—	—	—	7	4	9	10	—	7·6	17	2·86
		May	29·791	1·111	67·5	32·0	35·5	56·2	42·5	13·7	48·8	45·6	·285	3·3	0·5	83	544	—	—	—	—	—	—	—	—	—	9	1·02
		June	29·752	0·991	85·0	39·0	44·0	65·0	50·8	14·2	56·5	—	—	—	—	—	—	—	—	—	2	5	13	10	—	—	17	5·42
COCKERMOUTH (Cumberland), H. Dodgson, Esq., M.D., F.R.A.S., F.M.S.	148	April	29·668	1·220	64·3	31·0	33·3	58·3	40·0	13·3	46·0	39·3	·242	2·8	0·7	78	544	88·4	31·4	0·5	7	7	10	7	2·6	6·1	11	1·50
		May	29·713	1·218	63·6	33·8	29·8	57·0	43·1	13·9	48·4	43·2	·279	3·3	0·6	83	542	101·1	37·1	0·5	8	6	7	10	2·8	6·7	16	2·92
		June	29·646	1·115	80·3	38·7	41·6	64·5	50·2	14·3	55·7	49·9	·361	4·0	0·9	81	532	107·6	45·1	0·4	4	4	7	15	1·5	7·2	15	4·59
ALLENHEADS (Northumberland), Mr. S. Stobbs, Assistant to W. B. Beaumont, Esq., M.P.	1360	April	28·377	1·151	56·2	27·2	29·0	49·0	35·6	13·4	40·6	36·5	·216	2·6	0·4	86	526	95·5	33·6	0·2	—	—	—	—	—	6·5	15	5·18
		May	28·390	1·172	61·8	31·0	30·8	52·8	38·8	14·0	43·5	39·3	·241	2·7	0·5	85	523	109·1	36·5	0·2	—	—	—	—	—	6·9	21	4·44
		June	28·329	0·595	74·8	35·0	39·8	62·8	46·4	16·4	52·0	46·7	·320	3·6	0·8	82	512	117·3	44·5	0·2	—	—	—	—	—	7·9	22	4·20
SILLOTH RECTORY (Cumberland), Rev. Francis Redford, M.A., F.R.A.S., F.M.S.	28	April	29·849	1·305	65·0	30·5	34·5	56·1	39·5	16·6	46·5	39·3	·241	2·8	0·9	77	546	88·6	35·3	1·2	9	4	3	14	7·8	5·3	10	1·31
		May	29·833	1·256	66·7	32·6	34·1	59·4	42·7	16·7	49·4	43·2	·280	3·2	1·0	78	543	96·2	39·0	1·2	3	8	4	16	8·9	6·8	18	2·23
		June	29·758	1·094	81·8	40·0	41·8	67·2	49·6	17·6	56·4	50·1	·364	4·1	1·0	80	533	99·9	46·2	0·9	1	4	8	17	8·2	6·7	19	4·66
CARLISLE (Cumberland), J. Cartmell, Esq., F.M.S.	114	April	29·763	1·176	66·8	28·6	38·2	55·2	39·1	16·1	45·3	41·5	·260	2·9	0·5	84	546	89·5	33·1	2·2	5	6	6	13	7·5	6·4	18	1·28
		May	29·731	1·231	66·3	31·6	34·7	57·3	41·7	15·6	48·1	45·2	·300	3·5	0·5	90	542	95·5	36·0	2·0	6	2	4	19	7·6	7·3	22	2·24
		June	29·677	1·031	83·3	36·8	46·5	66·1	48·8	17·3	55·5	52·5	·397	4·4	0·5	90	533	99·9	44·0	1·5	3	2	6	19	6·7	7·6	21	4·05
BYWELL (Northumberland), Mr. John Dawson, Assistant to W. B. Beaumont, Esq., M.P.	87	April	29·734	1·177	66·0	34·0	32·0	54·3	41·2	13·1	45·7	38·6	·232	2·7	0·8	77	545	66·7	34·9	1·3	7	9	2	12	—	5·3	17	3·80
		May	29·734	1·163	68·0	36·0	32·0	57·9	44·7	13·2	49·6	41·9	·267	3·0	1·0	75	541	75·1	37·8	1·2	7	7	4	13	—	4·8	23	1·73
NORTH SHIELDS (Northumberland), Robert Spence, Esq.	124	April	29·799	1·207	63·6	33·0	30·6	52·0	39·4	12·6	44·5	38·2	·231	2·6	0·7	88	548	—	37·4	2·1	7	8	7	8	—	6·4	13	1·94
		May	29·775	1·202	67·0	34·2	32·8	54·7	42·0	12·7	47·2	40·0	·247	2·9	0·9	77	544	—	41·0	1·7	8	6	3	14	—	6·7	21	1·96
		June	29·734	0·911	71·0	39·8	31·2	62·6	49·0	13·6	54·5	48·4	·338	3·8	1·0	79	535	—	46·2	1·6	5	4	8	13	—	7·3	19	2·95
MILTOWN (Banbridge, Ireland), John Smyth, Esq., jun., M.A., M.I.C.E.I.	200	April	29·725	1·203	62·0	30·0	32·0	53·3	39·3	14·0	45·7	38·8	·237	2·7	0·8	78	545	90·8	35·6	2·4	7	3	14	6	4·7	5·7	15	4·17
		May	29·659	1·213	64·0	32·0	32·0	56·0	41·3	14·7	48·3	42·6	·275	3·2	0·7	81	540	100·2	38·3	2·0	9	2	6	14	3·6	6·3	11	2·65
		June	29·570	0·984	74·0	38·0	36·0	63·0	48·2	14·8	54·4	47·3	·325	3·7	1·2	77	532	110·3	46·0	1·9	3	2	18	7	2·9	6·4	21	3·61
CULLODEN (Inverness, Scotland), A. Forbes, Esq., F.M.S.	104	April	29·758	0·917	57·0	33·9	23·1	49·3	41·2	8·1	45·2	39·0	·229	2·8	0·8	79	546	88·0	33·8	0·5	7	6	7	10	8·8	5·4	16	0·92
		May	29·733	1·227	58·5	35·9	22·6	51·1	43·6	7·5	47·2	41·4	·261	3·0	0·7	81	543	91·8	37·0	—	8	5	8	10	8·9	5·8	20	3·63
		June	29·623	0·911	67·7	43·8	23·9	59·4	50·7	8·7	44·2	49·4	·351	4·0	0·9	81	533	123·0	23·4	0·8	4	7	7	12	8·4	6·6	21	4·94

***Second** Rain-gauges are placed*—

			April.	May.	June.	Total during the Quarter,
At Eastbourne, at the height of	4 feet	*above the ground*, the amount collected was	inches.	inches.	inches.	inches.
,, Portsmouth, ,,	20 feet	,, ,,	1·17 ,,	2·35 ,,	2·01 ,,	5·53 ,,
,, Strathfield Turgiss, ,,	88 feet	,, ,,	1·74 ,,	2·22 ,,	1·82 ,,	5·78 ,,
,, Eccles, Manchester, ,,	34 feet	,, ,,	2·59 ,,	2·18 ,,	4·76 ,,	9·53 ,,
,, Allenheads, ,,	6½ feet	,, ,,	5·90 ,,	4·44 ,,	4·38 ,,	14·72 ,,
,, Carlisle, ,,	3 feet	,, ,,	2·98 ,,	3·10 ,,	3·23 ,,	9·31 ,,
,, Miltown, Ireland, ,,	40 feet	,, ,,	3·92 ,,	2·52 ,,	3·13 ,,	9 57 ,,
,, Brighton, ,,	35 feet	,, ,,	0·53 ,,	2·30 ,,	1·84 ,,	4·67 ,,
,, Radcliffe Observatory,,,	22 feet	,, ,,	1·82 ,,	2·35 ,,	2·49 ,,	6·84 ,,
,, Marlborough College,,,	8 inches	,, ,,	1·90 ,,	2·12 ,,	3·23 ,,	7·25 ,,
,, ,, ,,	1 foot	,, ,,	1·85 ,,	2·14 ,,	3·28 ,,	7·27 ,,
,, Cardington, ,,	36 feet	,, ,,	1·30 ,,	1·50 ,,	2·00 ,,	4·80 ,,
,, Boston, ,,	6 feet	,, ,,	— ,,	— ,,	— ,,	— ,,
,, Nottingham, ,,	25½ feet	,, ,,	2·52 ,,	1·64 ,,	2·85 ,,	7·01 ,,
,, Wisbech, ,,	8 feet	,, ,,	3·69 ,,	2·08 ,,	2·86 ,,	8·83 ,,
,, Aldershot Camp, ,,	25 feet	,, ,,	1·16 ,,	1·98 ,,	2·04 ,,	5·18 ,,
,, Cockermouth, ,,	6½ feet	,, ,,	1·70 ,,	2·84 ,,	4·50 ,,	8·84 ,,
,, Holkham, ,,	4 feet	,, ,,	2·08 ,,	1·60 ,,	— ,,	— ,,

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	WIND. Mean Estimated Strength.	WIND. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°						
Guernsey - - -	29·638	78·0	39·0	39·0	57·0	46·9	24·8	10·1	51·1	45·5	·308	3·5	0·8	82	539	—	—	1·3	9	5	7	10	5·3
Helston - - - -	29·729	80·0	34·0	56·0	61·8	47·5	34·0	14·3	53·6	45·0	·302	3·5	1·2	73	538	88·1	41·9	2·0	9	3	7	12	5·0
Truro - - - -	29·662	80·0	30·0	50·0	59·7	44·8	36·7	14·9	50·4	43·6	·300	3·4	0·9	81	543	—	—	2·6	11	3	5	11	—
Sidmouth - - -	29·628	74·2	29·7	44·5	58·1	45·1	31·3	13·0	50·6	46·7	·320	3·7	0·6	86	543	—	—	1·3	6	3	6	15	—
Osborne - - -	29·613	82·7	30·9	51·8	62·8	44·0	41·8	18·8	51·8	46·0	·315	3·6	0·8	81	539	100·5	42·0	0·4	6	5	9	11	—
Portsmouth - -	29·652	79·0	30·4	48·6	62·4	42·4	39·4	20·0	51·2	43·5	·287	3·3	1·0	75	543	109·2	38·7	1·5	4	4	11	11	2·7
Worthing - - -	29·598	72·9	34·1	38·8	59·5	46·4	30·8	13·1	51·8	45·5	·305	3·4	0·9	79	541	132·8	41·5	1·1	5	4	8	13	4·8
Brighton - - -	29·602	78·0	32·0	46·0	60·6	46·6	34·7	14·0	52·0	46·8	·324	3·7	0·7	83	537	108·8	42·8	1·2	5	4	10	11	1·5
Lymington - - -	29·637	82·6	29·8	52·8	61·5	43·1	40·9	17·4	52·5	43·7	·288	3·2	1·2	72	540	—	—	0·7	7	4	9	10	—
Taunton - - -	29·613	84·2	26·9	57·3	61·8	42·7	44·0	19·1	51·1	46·4	·319	3·6	0·6	84	542	76·5	40·6	0·2	8	4	6	13	7·2
Wilton House - -	29·580	88·5	24·2	64·3	64·2	41·5	49·2	22·7	52·1	47·0	·332	3·7	0·8	83	537	108·2	39·3	1·5	9	3	10	9	4·8
Barnstaple - - -	29·598	79·0	32·0	47·0	61·0	46·0	35·3	15·0	52·3	46·5	·320	3·6	0·8	81	540	—	—	1·2	3	3	10	14	—
Aldershot Camp -	29·604	85·4	31·4	54·0	63·7	44·3	41·4	19·4	52·2	44·7	·294	3·4	1·0	76	534	112·4	42·0	1·5	7	4	9	11	2·5
Strathfield Turgiss -	29·629	88·2	24·9	63·3	62·6	40·9	47·6	21·7	51·5	44·2	·295	3·4	1·0	78	538	116·4	37·5	0·9	7	5	8	11	5·0
Weybridge Heath -	29·644	88·8	26·5	62·3	64·7	42·3	46·7	22·4	52·4	45·3	·309	3·5	1·0	77	539	115·9	39·7	0·7	8	4	11	6	1·9
Marlborough College	29·656	81·7	23·4	58·3	59·0	41·7	43·1	17·3	49·1	42·8	·279	3·2	0·8	79	563	122·7	35·5	—	9	4	6	12	3·2
Chislehurst - -	29·597	89·8	25·5	64·3	65·4	42·9	48·1	22·5	52·6	45·1	·306	3·5	1·1	76	539	119·7	38·0	—	7	4	8	12	—
Royal Observatory -	29·603	86·0	29·6	56·4	64·2	44·2	42·1	20·0	52·8	45·2	·305	3·5	1·1	75	537	135·7	30·3	0·4	7	5	8	11	—
Streatley Vicarage -	29·657	86·4	27·5	58·9	63·8	42·5	43·8	21·3	52·9	44·2	·298	3·4	1·1	75	538	74·4	—	2·0	8	3	7	12	—
St. John's Battersea	29·539	85·0	27·0	58·0	62·0	42·3	42·2	19·7	51·3	46·5	·322	3·7	0·7	85	541	95·4	41·4	1·7	1	1	18	11	—
Marylebone - -	—	85·7	30·0	55·7	64·0	44·1	44·0	19·9	52·8	44·0	·291	3·3	1·3	73	540	—	—	—	8	2	8	12	—
Camden Town - -	29·617	85·9	29·4	56·5	64·9	44·7	41·9	20·2	53·5	48·3	·300	3·4	1·3	73	534	107·2	41·8	—	6	3	9	12	—
Oxford - - -	29·615	85·4	28·6	56·8	61·7	44·3	42·5	17·4	51·8	44·1	·294	3·3	1·1	75	540	112·8	36·5	1·1	7	2	10	12	2·2
Gloucester - - -	29·612	89·0	31·5	57·5	64·2	44·1	45·4	20·1	52·2	43·6	·294	3·3	1·0	75	541	100·5	45·2	0·8	8	4	6	12	2·5
Royston - - -	29·625	88·0	26·8	61·2	64·5	42·6	48·0	21·9	51·7	44·9	·302	3·5	0·9	78	537	—	—	—	6	2	10	13	—
Leamington - -	29·613	84·6	31·2	53·4	62·1	44·0	41·5	18·1	51·8	48·3	·284	3·3	1·1	77	537	—	—	1·3	7	4	6	13	—
Somerleyton Rectory	29·572	82·3	27·2	55·1	62·1	43·3	40·8	18·8	51·2	47·1	·325	3·7	0·6	87	541	107·7	34·8	1·0	5	9	8	8	6·9
Norwich - - -	29·592	82·5	27·2	55·3	62·2	43·0	41·5	19·2	51·5	45·2	·296	3·5	0·9	80	540	—	—	—	7	4	9	10	—
Wisbech - - -	29·560	84·0	30·2	53·8	63·5	43·8	43·1	19·7	52·9	46·6	·321	3·7	0·9	80	540	115·1	40·4	0·6	6	5	9	10	3·3
Llandudno - - -	29·603	78·7	32·5	46·2	60·7	45·4	35·5	15·3	51·6	44·3	·289	3·3	1·0	77	539	—	—	0·6	6	4	4	16	—
Derby - - - -	29·547	84·0	31·0	53·0	61·3	44·1	41·6	17·2	50·7	46·1	·319	3·6	0·6	87	539	—	—	—	7	3	7	13	—
Hawarden - - -	29·585	80·0	34·0	46·0	58·6	49·1	35·5	9·5	51·1	45·4	·309	3·5	0·7	81	537	115·5	25·5	2·3	9	3	7	11	1·2
Eccles - - - -	29·603	82·5	30·0	52·5	59·6	42·7	43·4	16·9	50·3	43·1	·282	3·2	1·0	77	540	73·2	34·9	0·4	8	4	7	12	3·0
Moorside Observatory	29·527	82·8	28·1	54·7	58·9	40·3	41·4	18·6	48·0	42·9	·280	3·2	0·7	83	535	107·9	36·8	—	8	5	6	12	2·9
Park Road - - -	29·626	82·0	28·0	54·0	58·0	41·3	39·4	16·7	47·9	40·8	·255	2·9	0·9	77	533	97·7	37·3	—	—	—	—	—	—
Hull - - - -	29·569	81·0	28·0	53·0	61·4	42·3	41·7	19·1	50·4	43·9	·303	3·4	0·8	82	542	90·7	39·2	—	—	—	—	—	3·4
Stonyhurst - - -	29·558	81·5	30·2	51·3	58·8	43·5	38·8	15·3	49·4	44·0	·291	3·4	0·7	83	536	115·2	39·5	—	5	4	5	17	—
Bradford - - -	29·576	83·2	32·0	51·2	61·0	45·5	36·6	15·5	51·7	42·9	·277	3·1	1·4	71	524	85·8	—	1·1	—	—	—	—	—
Leeds - - - -	29·567	89·0	31·0	58·0	62·9	43·3	45·0	19·6	51·6	44·2	·294	3·1	1·0	77	538	—	—	1·5	6	4	7	13	—
York - - - -	—	83·0	30·0	53·0	58·1	44·4	39·0	13·7	50·4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cockermouth - -	29·511	80·3	31·0	49·3	58·3	44·4	34·9	13·8	50·0	44·1	·294	3·4	0·7	81	539	99·0	37·9	0·5	6	6	8	11	2·2
Silloth - - -	29·548	81·8	30·5	51·3	60·9	43·9	36·8	17·0	50·8	44·2	·295	3·4	1·0	78	541	94·9	40·2	1·1	4	5	5	16	8·3
Carlisle - - -	29·529	83·3	28·6	54·7	59·5	43·2	39·8	16·3	49·6	46·4	·319	3·6	0·5	88	540	95·0	37·7	1·9	5	3	5	17	7·5
North Shields - -	29·631	71·0	33·0	38·0	56·4	43·5	31·5	12·9	48·7	42·2	·272	3·1	0·9	81	542	—	42·2	1·8	7	6	6	19	—
Miltown (Ireland) -	29·588	74·0	30·0	44·0	57·4	42·9	33·3	14·5	49·5	42·9	·279	3·2	0·9	79	539	100·4	40·0	2·1	6	2	13	9	3·7

The highest temperatures of the air were at Chislehurst, 89°·8 ; Gloucester and Leeds, 89°·0 respectively ; Weybridge He Wilton House, 88°·5 ; and at Strathfield Turgiss, 88°·2.

The lowest temperatures of the air were at Marlborough College, 23°·4 ; Wilton House, 24°·2 ; Strathfield Turgiss, 24°·9 ; 25°·5 ; Weybridge Heath, 26°·5 ; and at Royston, 26°·8.

The greatest daily ranges of the temperatures of the air were at Wilton House, 22°·7 ; Chislehurst, 22°·5 ; Weybridge He Royston, 21°·9 ; Strathfield Turgiss, 21°·7 ; and Streatley Vicarage, 21°·3.

The least daily ranges of the temperatures of the air were at Hawarden, 9°·5 ; Guernsey, 10°·1 ; North Shields, 12°·9 ; Worthing, and Carlisle, 13°·0 respectively ; and Cockermouth, 13°·8.

The greatest numbers of rainy days were at Stonyhurst, 73 ; Eccles, 61 ; Carlisle, 61 ; Hawarden, 59 ; Halifax, 55 ; and at G North Shields 53 respectively.

The least numbers of rainy days were at Worthing, 37 ; Leamington, 38 ; Bradford, 39 ; and Portsmouth and Brighton, 41.

The heaviest falls of rain were at Park Road, Halifax, 13·73 inches ; Stonyhurst, 11·92 inches ; Bradford, 11·16 inch Eccles, 10·95 inches.

The least falls of rain were at Worthing, 5·52 inches ; Royal Observatory, 5·71 inches ; Brighton, 5·72 inches ; and O inches.

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	WIND. Mean Estimated Strength.	WIND. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°						
Guernsey - - - -	29·638	78·0	39·0	39·0	57·0	46·9	24·8	10·1	51·1	45·5	·308	3·5	0·8	82	539	—	—	1·3	9	5	7	10	5·5
Between the latitudes 50° and 51° -	29·640	78·7	31·4	47·3	60·8	45·0	36·2	15·8	51·7	45·1	·305	3·5	0·9	79	540	107·9	41·4	1·3	7	4	8	12	3·5
51° and 52° -	29·610	85·9	27·9	58·0	63·1	43·2	43·8	19·9	52·0	45·2	·304	3·5	1·0	78	540	108·3	39·0	1·1	7	3	9	11	3·7
52° and 53° -	29·588	83·4	29·4	54·0	62·3	43·7	41·7	18·6	51·6	45·4	·292	3·5	0·9	81	539	111·4	37·6	0·9	6	4	8	12	5·1
53° and 54° -	29·576	82·7	30·2	52·5	59·9	43·5	40·2	16·4	50·1	43·4	·286	3·3	0·9	79	536	98·0	35·5	1·3	7	4	6	13	2·7
54° and 55° -	29·539	81·8	30·0	51·8	59·6	43·8	37·2	15·8	50·1	44·9	·303	3·5	0·7	82	540	96·3	38·6	1·2	5	5	6	15	6·0
North Shields - - -	29·631	71·0	33·0	38·0	56·4	43·5	31·5	12·9	48·7	42·2	·272	3·1	0·9	81	542	—	42·2	1·8	7	6	6	12	—
Miltown, Banbridge (Ireland) -	29·588	74·0	30·0	44·0	57·4	42·9	33·3	14·5	49·5	42·9	·279	3·2	0·9	79	539	100·4	40·0	2·1	6	2	13	9	3·7
Mean for the Quarter 50° to 55° Year 1869	29·686	79·0	30·7	48·3	59·9	43·7	38·3	16·2	50·7	44·1	·291	3·3	0·9	80	540	—	39·5	1·3	8	8	6	8	—
„ 1870	29·792	82·6	28·1	54·5	63·9	44·4	44·1	19·5	52·8	44·9	·303	3·4	1·1	75	541	107·0	37·7	1·2	7	4	6	13	—
„ 1871	29·644	77·9	28·5	49·4	61·1	43·6	39·1	17·5	50·8	44·4	·294	3·3	0·9	79	540	—	38·0	0·7	8	8	5	9	—
„ 1872	29·591	82·5	29·6	52·7	61·1	43·8	39·8	17·3	51·1	44·8	·298	3·5	0·9	80	539	104·4	38·4	1·2	6	4	7	13	4·2

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING SEPTEMBER 30, 1872.

[illegible]ARKS ON THE WEATHER DURING THE QUARTER ENDING SEPTEMBER 30TH, 1872.

By JAMES GLAISHER, ESQ., F.R.S., *&c., Secretary of The Meteorological Society.*

[illegible]he weather during the whole quarter has been changeable, the mean temperature of the first [illegible] in July was in excess of the average to the amount of 4½° daily; a cold period began on [illegible] 8th, and continued till the 18th, the deficiency of temperature averaged 1° daily; the [illegible]nest period in the quarter then set in and continued for 11 days till the 29th, the average [illegible]s of temperature daily was 7°·9. A cold period followed, rain fell copiously and generally [illegible]emperature was below its average on every day from July 30th to August 15th, the average [illegible] deficiency was 3°. The weather improved on the 16th but became broken towards the end [illegible]e month, and was changeable till the end of the first week in September, with very mild, [illegible]st summer-like temperature; in the second week the weather was unsettled, particularly in the [illegible]h, where a great deal of rain fell, in the south it was finer and but little rain fell; the excess of [illegible]erature for the 33 days ending September 17th was 3¾° daily; from this day to the end of [illegible] quarter the weather was broken, of uncongenial character, rain fell generally, and the daily [illegible]erature was on the average deficient by 5°.

[illegible]he most remarkable feature of this quarter has been the frequency of thunderstorms. In July [illegible] were prevalent from the 6th to the 14th, and from the 21st to the end of the month, in August [illegible] the 5th to the 12th, and from the 21st to the end of the month, and in September from the [illegible]o the 6th, and from the 19th to the 29th, and several of the storms on these days have [illegible]nded over very large areas.

[illegible] consequence of the changeable weather the hay harvest was not completed in July. In [illegible] south of England reaping began about the 20th of July, and the wheat crops were nearly [illegible]secured at the end of August, at this time rather more than one half had been gathered [illegible]e midland and northern counties, and in Scotland and Ireland had only just began.

[illegible]oth in August and September the heavy rains and frequent thunderstorms very frequently [illegible]rrupted harvest operations, and at the end of the quarter but little progress had been made [illegible]er in the north of Ireland or Scotland where operations had been further checked by sleet and [illegible]w.

[illegible]now has fallen in Cumberland and Westmorland unusually early, and harvest operations have [illegible] delayed.

[illegible]he accounts of the potatoe crop are bad.

[illegible]he readings of the barometer during July at the height of 160 feet above sea level were [illegible] steady throughout the month, the highest reading being 30·1 in. and the lowest 29·5 in., [illegible] giving a range of but little more than half an inch. The departures of the mean daily values [illegible] the average were but small throughout.

[illegible]arger movements were experienced during the earlier portion of August, a tendency being [illegible]wn, however, to decrease till the 7th when the minimum value for the month (29·3 in.) was [illegible]stered. After this date increasing values were recorded, and readings close to or at times in [illegible]ess of 30 in. were recorded, the absolute maximum for the month (30·1 in.) occurring on the [illegible]. The range of reading during August was 0·8 in.

[illegible]he principal movements during September were:—a decrease to 29·4 in. on the third, a general [illegible]ease to 30·1 in. by the 13th, a second decrease to 29·4 in. by the 18th, an increase to 29·8 in. [illegible]dy by the 22d, a sudden decrease to 29·2 in. by the 24th, and several other smaller oscillations [illegible] the end of the month. The mean daily values were with few exceptions entirely in defect of the [illegible]age. The range of reading in the month amounted to 0·9 in.

[illegible]72. [illegible]THS.	Temperature of: Air. Mean.	Air. Diff. from average of 101 years.	Air. Diff. from average of 31 years.	Evaporation. Mean.	Evaporation. Diff. from average of 31 years.	Dew Point. Mean.	Dew Point. Diff. from average of 31 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 31 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 31 years.	Weight of vapour in a Cubic Foot of Air. Mean.	Weight of vapour. Diff. from average of 31 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
[illegible]y -	65·0	+3·4	+3·0	60·9	+3·4	57·5	+3·7	23·4	+2·4	67·4	0·473	+0·058	5·3	+0·7
[illegible]gust	61·0	+0·2	−0·4	56·5	−0·8	53·6	−0·1	20·4	+0·6	65·5	0·412	−0·004	4·5	−0·1
[illegible]t. -	57·4	+0·9	+0·1	54·0	−0·1	50·8	−0·3	19·1	+0·6	62·0	0·371	−0·009	4·2	0·0
[illegible]an -	61·1	+1·5	+0·9	57·1	+0·8	54·0	+1·1	21·0	+1·2	65·0	0·319	+0·015	4·7	+0·2

[illegible]72. [illegible]THS.	Degree of Humidity. Mean.	Degree of Humidity. Diff. from average of 31 years.	Reading of Barometer. Mean.	Reading of Barometer. Diff. from average of 31 years.	Weight of a Cubic Foot of Air. Mean.	Weight of a Cubic Foot of Air. Diff. from average of 31 years.	Rain. Amount.	Rain. Diff. from average of 57 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
[illegible]y -	78	+ 3	29·759	−0·041	524	− 4	2·4	−0·1	185	0	3	28	38·1	60·1
[illegible]gust	75	− 1	29·800	+0·008	529	0	2·7	+0·3	224	0	3	28	35·9	54·2
[illegible]t. -	79	− 1	29·681	−0·130	531	− 2	1·4	−1·0	319	4	9	17	26·0	57·9
[illegible]an -	77	0	29·747	−0·055	528	− 2	Sum 6·5	Sum −0·8	Mean 243	Sum 4	Sum 15	Sum 73	Lowest 26·0	Highest 60·1

[illegible]TE.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the [illegible]sign (+) signifies above the average.

[illegible]E. & S.—550.—11/72.

The mean temperature of July was $65^{\circ}\cdot 0$, being $3^{\circ}\cdot 4$ higher than the average of the preceding 101 years, higher than the corresponding value in 1871 by $3^{\circ}\cdot 3$, but lower than in 1870 by $0^{\circ}\cdot 4$.

The mean temperature of August was $61^{\circ}\cdot 0$, being $0^{\circ}\cdot 2$ higher than the average of 101 years, $3^{\circ}\cdot 8$ lower than in 1871, and of nearly the same value as that recorded in 1870.

The mean temperature of September was $57^{\circ}\cdot 4$, being $0^{\circ}\cdot 9$ higher than the average of 101 years, the same as the corresponding temperature of last year, but $1^{\circ}\cdot 7$ higher than in 1870.

The mean high day temperatures were respectively $4^{\circ}\cdot 1$ and $0^{\circ}\cdot 5$ higher than their averages in July and September, but of the same value in August.

The mean low night temperatures were $0^{\circ}\cdot 6$ and $0^{\circ}\cdot 1$ lower than their respective averages in August and September, but $1^{\circ}\cdot 7$ higher in July.

Therefore the days and nights of July were warm, and those of August and September of tolerably equable temperature.

The daily ranges of temperature were greater than their respective averages in each of the three months.

The fall of rain was 0·1 in. and 1·0 in. respectively in defect in July and September, but 0·3 in. in excess in August.

The mean temperature of the air in the three months ending August, constituting the three summer months, was $61^{\circ}\cdot 7$, being $1^{\circ}\cdot 5$ higher than the average for 101 years.

Thunderstorms occurred on the 6th of July at Guernsey, Helston, Truro, Sidmouth, Chislehurst, London, Gloucester, Cardington, Leamington, and Somerleyton; on the 7th at Truro, Gloucester, Leamington, Llandudno, Hawarden, Liverpool, Eccles, Halifax, Stonyhurst, Cockermouth, Silloth, and Carlisle; on the 9th at Royston, Cardington, and Leamington; on the 11th at Guernsey, Osborne, Portsmouth, Worthing, Brighton, Aldershot Camp, Marlborough College, Chislehurst, Streatley, London, Oxford, Royston, Cardington, Holkham, Hawarden, Eccles, Hull, Leeds, Cockermouth, Allenheads, Silloth, Carlisle, Bywell, and North Shields; on the 12th at Royston, Somerleyton, Norwich, Wisbech, Liverpool, Eccles, Halifax, Stonyhurst, Bradford, Leeds, Cockermouth, Silloth, Carlisle, and Miltown; on the 13th at Worthing, Salisbury, Aldershot Camp, Strathfield Turgiss, Marlborough College, London, Oxford, Royston, Cardington, Leamington, Norwich, and Liverpool; on the 14th at Bywell and North Shields; on the 21st at Guernsey and London; on the 22d at Sidmouth, Osborne, Portsmouth, Worthing, Brighton, Salisbury, Aldershot Camp, Strathfield Turgiss, Lymington, Chislehurst, London, Royston, Cardington, Cockermouth, and North Shields; on the 23d at Worthing, Brighton, Strathfield Turgiss, London, Royston, Cardington, Somerleyton, and Wisbech; on the 24th at Guernsey, Lymington, Chislehurst, Streatley, Royston, Cardington, Wisbech, Liverpool, Eccles, Halifax, Stonyhurst, Cockermouth, and Silloth; on the 25th at Sidmouth, Osborne, Portsmouth, Salisbury, Aldershot Camp, Strathfield Turgiss, Lymington, Marlborough College, Chislehurst, London, Oxford, Gloucester, Royston, Cardington, Leamington, Llandudno, Liverpool, Eccles, Halifax, Stonyhurst, Bradford, Allenheads, Bywell, North Shields, and Miltown; on the 26th at Brighton, Salisbury, Stonyhurst, Cockermouth, Silloth, Bywell, North Shields, and Miltown; on the 27th at Somerleyton, Norwich, and Holkham; on the 28th at Allenheads; on the 29th at Royston, Norwich, Llandudno, Liverpool, Eccles, Stonyhurst, Cockermouth, and Carlisle; on the 30th at Aldershot Camp, Chislehurst, and London; and on the 31st at Holkham. On the 2d of August at Helston, Truro, Worthing, Taunton, Leamington, and Holkham; on the 5th at Wisbech, Holkham, and Hawarden; on the 6th at London, Gloucester, Holkham, Liverpool, Eccles, Halifax, Stonyhurst, and North Shields; on the 7th at Sidmouth, Osborne, Taunton, Salisbury, Aldershot Camp, Strathfield Turgis, Marlborough College, Chislehurst, Streatley, London, Oxford, Gloucester, Royston, Cardington, Leamington, Wisbech, Llandudno, Holkham, Hawarden, Liverpool, Eccles, Halifax, Stonyhurst, Allenheads, Bywell, and North Shields; on the 8th at Salisbury, Chislehurst, Streatley, Oxford, Cardington, and Eccles; on the 9th at Holkham; on the 10th at Gloucester; on the 11th at North Shields; on the 12th at North Shields; on the 25th at Holkham; on the 26th at Eccles, Hull, Stonyhurst, York, Silloth, and Carlisle; and on the 30th at Holkham, Stonyhurst, Cockermouth, and Silloth. On the 2d of September at Guernsey, and Somerleyton; on the 3d at Guernsey, Helston, Truro, Sidmouth, Osborne, Portsmouth, Worthing, Brighton, Lymington, Llandudno, Holkham, Eccles, Halifax, Stonyhurst, Allenheads, Carlisle, and North Shields; on the 4th at Guernsey, Osborne, Brighton, Salisbury, Barnstaple, Aldershot Camp, Lymington, Marlborough College, Gloucester, Royston, Cardington, Norwich, Wisbech, Llandudno, Hawarden, Liverpool, Eccles, Halifax, Hull, Stonyhurst, Leeds, York, Carlisle, North Shields, and Miltown; on the 5th at Holkham, Silloth, and Carlisle; on the 6th at Carlisle; on the 9th at Eccles, Stonyhurst, and Leeds; on the 19th at Norwich and Holkham; on the 20th at Liverpool; on the 21st at Worthing; on the 23d at Sidmouth; on the 24th at Guernsey, Helston, Osborne, and Hawarden; on the 27th at Cardington; on the 28th at Holkham and Hawarden; and on the 29th at Wisbech, Holkham, and Hawarden.

Thunder was heard, but lightning was not seen, on the 4th of July at Hull; on the 6th at Strathfield Turgiss, Streatley, Royston, Hull, Stonyhurst, and Leeds; on the 8th at Hull; on the 9th at Hull; on the 11th at Halifax and Stonyhurst; on the 12th at Cardington and Allenheads; on the 13th at Portsmouth, Chislehurst, Streatley, London, Somerleyton, and Bywell; on the 14th at Bywell; on the 19th at Cockermouth; on the 22d at Oxford, Gloucester, Llandudno, Liverpool, Halifax, Stonyhurst, Allenheads, Silloth, and Culloden; on the 23d at Portsmouth and Aldershot Camp; on the 24th at London, Llandudno, Hull, Allenheads, and Bywell; on the 25th at Worthing, Brighton, Oxford, Llandudno, and Cockermouth; on the 26th at Strathfield Turgiss, Llandudno, and Culloden; on the 27th at Guernsey, Worthing, Stonyhurst, Cockermouth, Allenheads, and Bywell; on the 28th at Guernsey, Worthing, Cockermouth, and Bywell; on the 29th at Oxford, Halifax, and Allenheads; and on the 30th at Oxford. On the 2d of August at Chislehurst, Streatley, Oxford, Gloucester, Cardington, and Wisbech; on the 3d at Hull; on the 5th at Llandudno; on the 6th at Llandudno, Hull, and Bywell; on the 7th at Guernsey, Carlisle, and Culloden; on the 8th at Osborne, Worthing, Gloucester, and Royston; on the 9th at Halifax and Carlisle; on the 12th at Bywell; on the 15th at Bywell; on the 21st at Salisbury; on the 24th at North Shields; on the 26th at Halifax and Allenheads; on the 30th at Eccles; and on the 31st at Streatley and Holkham. On the 3d of September at Streatley, Eccles, and Silloth; on the 5th at Cockermouth;

on the 19th at Streatley, Royston, and Somerleyton; on the 20th at Somerleyton; on the 21st at Llandudno and Hawarden; on the 22d at Llandudno; on the 23d at Llandudno; on the 24th at Llandudno; on the 28th at Carlisle; and on the 29th at Oxford, Eccles, and Hull.

Lightning was seen, but thunder was not heard, on the 6th of July at Portsmouth and Strathfield Turgiss; on the 7th at Cardington; on the 11th at Wisbech; on the 13th at Portsmouth; on the 23d at Portsmouth, Aldershot Camp, Oxford, Gloucester, and Norwich; on the 24th at Portsmouth, Worthing, Brighton, Aldershot Camp, London, Oxford, Llandudno, and Culloden; on the 25th at Portsmouth, Brighton, Strathfield Turgiss, Chislehurst, Oxford, Gloucester, Norwich, and Llandudno; on the 26th at Portsmouth; on the 27th at Worthing, Brighton, and London; on the 28th at Portsmouth and Worthing; and on the 30th at Stonyhurst. On the 2d of August at Guernsey and Portsmouth; on the 5th at Portsmouth, Worthing, Brighton, Oxford, and Cardington; on the 6th at Llandudno, Allenheads, Silloth, and Carlisle; on the 7th at Truro and Worthing; on the 8th at Llandudno and Halifax; on the 9th at York; on the 10th at Carlisle and North Shields; on the 20th at Llandudno; on the 21st at Sidmouth and Worthing; on the 25th at Hull, Stonyhurst, Allenheads, Silloth, and Carlisle; and on the 30th at Helston, Truro, Hawarden, Liverpool, Halifax, Allenheads, Carlisle, and North Shields. On the 3d of September at Portsmouth, Lymington, Oxford, Cardington, Liverpool, Eccles, Hull, and Leeds; on the 4th at Portsmouth, Taunton, Weybridge, Oxford, Llandudno, Holkham, York, and Silloth; on the 5th at Llandudno; on the 9th at Carlisle; on the 19th at Worthing, Brighton, Salisbury, Strathfield Turgiss, Weybridge, London, Llandudno, and Hawarden; on the 20th at Wisbech, Hawarden, and Hull; on the 21st at Llandudno, Liverpool, Stonyhurst, and Cockermouth; on the 23d at Llandudno and Liverpool; and on the 24th at Portsmouth, Worthing, Brighton, Oxford, Llandudno, Eccles, Hull, Stonyhurst, Cockermouth, and Carlisle.

Solar halos were seen on 6 days in July; on 9 days in August; and on 7 days in September.

Lunar halos were seen on the 19th of July at Brighton; and on the 29th at Marlborough College. On the 15th of August at Portsmouth, Weybridge, and Oxford.

Auroræ Boreales were seen on the 1st of July at Brighton; on the 2d at Brighton; on the 7th at Portsmouth; on the 8th at Oxford; and on the 30th at Brighton. On the 1st of August at Brighton; on the 2d at North Shields; on the 3d at Guernsey and Silloth; on the 4th at Culloden; on the 6th at Brighton; on the 8th at Guernsey, Helston, Taunton, Oxford, Llandudno, Hawarden, Silloth, and Culloden; on the 9th at Llandudno and York; on the 10th at Allenheads; on the 13th at Culloden; on the 14th at Brighton, Oxford, Llandudno, Stonyhurst, and Culloden; on the 18th at York; and on the 29th at Brighton. On the 2d of September at Brighton and Cockermouth; on the 3d at Llandudno and Hawarden; on the 4th at Brighton; on the 5th at Brighton and York; on the 6th at York; on the 8th at Eccles; on the 9th at Hawarden, Stonyhurst, York, Cockermouth, and Silloth; on the 17th at Oxford and Silloth; on the 21st at Silloth; and on the 19th at York, Carlisle, and North Shields.

Snow fell on the 21st of September at Hawarden and York; on the 25th on Skiddaw and other mountains near Cockermouth; and on the 24th at Allenheads and on the neighbouring hills of Carlisle.

Hail fell on 8 occasions in July; on 3 in August; and on 8 in September.

Fog was prevalent on 40 days during the quarter; mostly in the north.

Spanish Chestnut in flower on the 25th of July at Culloden.

Lime in flower on the 23d of July at Culloden.

Privat first in blossom on the 12th of July at Carlisle.

Portugal Laurel first in blossom on the 8th of July at Culloden.

Honeysuckle first in blossom on the 5th of July at Culloden.

Cherry ripe on the 2d of August at Helston.

Gooseberry ripe on the 5th of August at Culloden.

Currant ripe on the 1st of August at Culloden.

Strawberry ripe on the 10th of August at Culloden.

Raspberry ripe on the 12th of August at Culloden.

Apricot ripe on the 20th of August at Culloden.

Hardy Apple ripe on the 29th of August at North Shields; and on the 30th at Miltown.

Hardy Pear ripe on the 20th of August at Miltown.

Peach ripe on the 8th of August at Helston. On the 20th of September at Miltown.

Plum ripe on the 4th of August at Helston. On the 4th of September at Miltown.

Wheat in flower on the 1st of July at Helston; and on the 12th at Culloden.

Wheat cut on the 27th of July at Royston; on the 29th at Osborne, Chislehurst, and Cardington; on the 30th at Brighton and Oxford. On the 1st of August at Guernsey; on the 4th at Weybridge; on the 10th at Helston; on the 12th at Llandudno; on the 19th at Carlisle; on the 25th at Miltown; and on the 28th at North Shields. On the 14th of September at Silloth.

Barley in flower on the 10th of July at Culloden.

Barley in ear on the 2d of July at Helston.

Barley cut on the 2d of August, at Weybridge; on the 6th at Llandudno; on the 10th at Guernsey; and on the 12th at Helston and Carlisle.

Rye cut on the 13th of July at Brighton and Chislehurst. On the 26th of August at Culloden.

Oats in flower on the 5th of July at Culloden.

Oats in ear on the 2d of July at Helston.

Oats cut on the 27th of July at Osborne; on the 28th at Helston; and on the 29th at Chislehurst and Oxford. On the 1st of August at Weybridge; on the 19th at Stonyhurst; on the 20th at Guernsey; and on the 30th at Miltown.

Peas cut on the 27th of August at Culloden.

Flax pulled on the 20th of August at Miltown.

Swallow departed on the 22d of August from Oxford. On the 30th of September from Silloth.

Swift departed on the 31st of August from Culloden.

Woodcock arrived on the 27th of September at Helston.

Snipe arrived on the 6th of September at Helston.

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MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING SEPTEMBER 30TH, 1872.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1872. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat.ⁿ = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S.	204	July	29·725	0·610	78·5	53·5	25·0	67·1	57·4	9·7	60·8	55·2	·437	4·9	1·0	83	528	–	–	0·9	7	7	8	9	3·1	3·6	12	4·53
		Aug.	29·775	0·852	74·0	52·5	21·5	66·1	57·2	8·9	60·8	54·6	·421	4·7	1·2	80	529	–	–	1·0	6	6	7	12	3·7	3·3	11	2·19
		Sept.	29·714	0·962	74·5	41·5	33·0	63·5	54·9	8·6	58·7	53·0	·404	4·5	0·9	81	530	–	–	1·5	3	2	10	15	4·5	3·8	18	2·14
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	106	July	29·856	0·694	83·0	52·0	31·0	71·9	58·6	13·3	63·1	55·9	·448	5·0	1·6	78	528	106·5	51·5	1·9	5	4	14	8	3·8	4·8	15	3·39
		Aug.	29·912	0·867	84·0	46·0	38·0	70·8	57·2	13·6	62·4	55·5	·441	5·0	1·4	78	526	101·3	49·9	2·2	7	6	6	12	4·2	4·4	12	2·21
		Sept.	29·810	0·963	75·0	35·0	40·0	65·8	55·1	10·7	59·4	51·3	·378	4·4	1·4	76	528	83·9	47·7	2·3	4	1	9	16	4·9	5·9	20	2·94
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	July	29·910	0·598	83·0	48·0	35·0	69·1	56·0	13·1	60·2	56·0	·450	5·1	0·8	87	532	–	–	2·2	7	7	10	7	–	6·6	12	2·69
		Aug.	29·968	0·842	80·0	43·0	37·0	69·8	54·0	15·8	60·0	51·7	·385	4·3	1·5	74	533	–	–	2·5	12	7	4	8	–	5·0	12	1·99
		Sept.	29·868	0·915	72·0	31·0	41·0	64·5	53·0	11·5	57·2	48·9	·345	3·9	1·4	74	535	–	–	2·8	5	3	5	17	–	7·1	23	3·26
SIDMOUTH (Devon), J. Ingleby Mackenzie, Esq., M.B., F.M.S.	30	July	29·907	0·614	75·2	49·0	26·2	69·0	54·5	14·5	60·6	57·6	·476	5·3	0·6	90	531	–	–	0·9	4	1	10	16	–	2·9	15	4·36
		Aug.	29·972	0·882	73·1	45·5	27·6	67·0	54·6	12·4	60·2	54·9	·432	4·9	1·0	83	533	–	–	1·1	5	4	12	10	–	2·4	15	2·07
		Sept.	29·925	0·970	69·4	35·2	34·2	62·8	51·5	11·3	56·5	53·6	·412	4·6	0·5	90	536	–	–	1·4	8	0	6	16	–	3·2	18	1·77
EASTBOURNE (Sussex), Miss W. L. Hall.	12	April	29·914	1·388	68·8	31·7	37·1	59·9	42·4	17·5	49·9	42·7	·275	3·1	1·0	77	544	113·0	35·1	0·5	7	4	12	7	3·6	–	13	0·95
		May	29·911	0·911	73·3	29·9	43·4	63·3	44·2	19·1	52·4	44·3	·291	3·4	1·1	74	541	110·9	38·5	0·7	7	6	7	11	4·7	–	14	2·59
		June	29·944	0·729	78·1	40·9	37·2	66·4	51·8	14·6	58·2	52·5	·396	4·5	1·0	81	535	118·7	46·0	0·6	3	3	11	13	4·7	–	16	2·32
		July	29·925	0·537	83·3	49·1	34·2	74·4	56·6	17·8	63·9	59·5	·506	5·5	1·1	85	528	120·8	51·3	0·3	2	7	10	12	2·9	–	12	1·90
		Aug.	29·974	0·793	78·2	47·6	30·6	71·4	54·9	16·5	62·0	55·5	·441	4·9	1·3	80	531	118·8	48·8	0·7	7	8	7	9	4·0	–	12	1·83
		Sept.	29·893	0·911	76·2	33·8	42·4	67·1	52·2	14·9	58·9	54·7	·433	4·7	0·8	86	533	107·6	46·7	0·7	2	2	9	17	4·7	–	14	2·56
OSBORNE (Isle of Wight), J. R. Mann, Esq.	172	July	29·763	0·575	87·1	47·3	39·8	76·5	55·1	21·4	63·9	58·1	·484	5·4	1·2	81	525	115·0	53·2	0·9	4	6	12	9	–	4·8	12	2·84
		Aug.	29·808	0·847	80·1	43·7	36·4	72·7	53·7	19·0	61·3	54·3	·421	4·7	1·3	78	529	108·7	51·7	0·8	7	7	9	8	–	5·3	11	1·86
		Sept.	29·708	0·945	81·9	34·0	47·9	67·5	51·0	16·5	58·0	55·2	·436	4·9	0·5	90	531	99·6	49·7	0·3	2	1	12	15	–	6·1	17	1·97
PORTSMOUTH, William C. Ellis, Esq., F.M.S.	16	July	29·939	0·577	81·6	45·4	36·2	74·8	53·4	21·4	62·7	54·7	·430	4·8	1·6	75	531	122·7	49·2	1·2	2	7	12	10	3·1	5·0	17	3·72
		Aug.	29·983	0·818	78·6	44·4	34·2	71·6	51·5	20·1	60·6	50·5	·367	4·1	1·8	73	533	116·6	47·6	1·6	5	6	10	10	2·5	6·3	11	1·68
		Sept.	29·883	0·965	78·2	33·0	45·2	67·3	48·6	18·7	57·4	50·1	·363	4·1	1·2	77	534	100·2	40·2	1·7	2	2	9	17	2·4	6·2	17	1·92
WORTHING (Sussex), W. J. Harris, Esq. M.R.C.S.E., L.S.A.	31	July	29·893	0·571	78·0	49·2	28·8	71·1	57·6	13·5	63·1	56·7	·460	5·0	1·3	79	528	135·9	52·3	0·8	4	5	12	10	5·9	4·5	11	1·82
		Aug.	29·938	0·820	75·2	47·8	27·4	70·2	55·2	15·0	61·4	53·2	·405	4·5	1·5	75	531	133·9	49·8	1·1	6	6	7	12	4·6	4·6	11	1·64
		Sept.	29·854	0·937	73·2	35·1	38·1	65·8	52·2	13·6	57·8	52·7	·398	4·4	0·9	82	533	121·0	46·2	1·2	4	1	5	20	3·1	5·7	10	1·66
BRIGHTON (Sussex), Frederick E. Sawyer, Esq., F.M.S.	200	July	29·733	0·569	81·8	48·4	33·4	71·6	57·8	13·8	63·5	57·3	·469	5·2	1·3	80	525	121·9	54·5	0·8	5	5	11	10	1·0	5·5	12	1·31
		Aug.	29·767	0·835	76·9	48·0	28·9	69·3	55·2	14·1	60·7	54·0	·417	4·7	1·3	79	528	118·5	50·9	1·2	7	5	7	12	1·3	5·0	13	1·81
		Sept.	29·670	0·979	73·2	37·7	35·5	65·1	52·3	12·8	57·5	53·2	·392	4·3	0·9	83	531	105·2	46·8	1·3	2	2	7	19	0·2	6·0	13	2·19
LYMINGTON (Hants), George J. Jones, Esq.	77	July	29·847	0·566	84·2	44·9	39·3	73·2	54·5	18·7	63·0	54·5	·426	4·5	1·7	74	528	–	–	0·8	5	5	12	9	–	4·6	14	3·25
		Aug.	29·912	0·721	82·0	43·4	38·6	71·1	52·3	18·8	61·4	51·6	·382	4·2	1·9	71	531	–	–	1·1	4	9	9	9	–	4·4	8	1·78
		Sept.	29·808	0·877	79·2	31·0	48·2	66·1	54·0	12·1	61·3	46·6	·322	3·6	2·5	59	530	–	–	0·9	8	1	6	18	–	4·4	10	2·02

Station	feet	Month	in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
BARNSTAPLE (Devon), T. MACKRELL, Esq.	43	July	29·888	0·883	89·0	50·0	39·0	72·4	56·3	16·1	64·4	56·4	·456	5·0	1·6	75	527	–	–	1·2	3	3	16	9	–	3·0	16	6·35
		Aug.	29·922	0·917	84·5	45·0	39·5	71·5	54·0	17·5	61·3	53·4	·400	4·6	1·5	76	531	–	–	1·3	3	5	11	12	–	3·0	14	2·82
		Sept.	29·823	0·988	75·0	35·5	39·5	64·4	53·5	10·9	57·8	53·4	·410	4·6	0·8	85	523	–	–	1·3	1	2	12	15	–	4·7	25	5·14
ALDERSHOT CAMP (Hants), JOHN ARNOLD, Esq., M.S.C., F.M.S.	325	July	29·569	0·550	88·4	48·0	40·4	79·0	55·8	23·2	65·0	59·5	·510	5·6	1·2	83	520	127·1	53·3	1·0	5	6	9	11	2·0	6·2	15	2·69
		Aug.	29·623	0·856	81·4	46·4	35·0	73·4	52·5	20·9	60·7	56·9	·465	5·2	0·8	88	526	119·8	30·6	1·3	7	7	8	9	1·5	6·1	12	2·24
		Sept.	29·505	0·867	81·0	35·4	45·6	68·3	49·7	18·6	57·3	51·0	·374	4·2	1·1	83	528	108·3	47·6	1·6	2	1	9	18	2·2	6·5	12	1·60
STRATHFIELD TURGISS (Hants), REV. C. H. GRIFFITH, M.A., F.M.S.	197	July	29·728	0·612	89·0	42·3	46·7	77·4	52·9	24·5	63·8	55·5	·441	4·9	1·5	75	525	136·1	49·6	0·7	3	8	11	9	4·1	5·4	13	3·12
		Aug.	29·775	0·874	83·3	40·2	43·1	73·1	50·4	22·7	60·2	51·6	·382	4·3	1·5	73	531	124·8	45·0	0·7	8	8	7	8	4·6	4·8	14	1·48
		Sept.	29·658	0·949	81·0	30·2	50·8	68·0	48·3	19·7	57·2	51·6	·382	4·3	0·9	82	534	114·0	41·0	0·8	3	1	8	18	4·8	4·7	12	1·49
WEYBRIDGE HEATH (Surrey), WILLIAM F. HARRISON, Esq., F.M.S.	150	Aug.	29·932	0·636	84·0	42·0	42·0	73·4	49·7	23·7	60·0	53·8	·415	4·6	1·2	80	532	118·3	48·0	0·6	–	–	–	–	1·3	4·0	10	1·88
		Sept.	29·730	0·852	82·3	31·3	51·0	67·4	47·2	20·2	56·3	49·9	·360	4·0	1·0	79	533	104·9	44·4	0·9	4	3	10	13	1·2	5·0	13	1·27
MARLBOROUGH COLLEGE (Wilts), REV. THOMAS A. PRESTON, M.A.	456	July	29·467	0·539	83·3	41·4	41·9	72·0	52·7	19·3	61·2	53·9	·416	4·7	1·4	78	528	140·7	44·7	–	7	2	12	10	2·7	5·7	10	2·63
		Aug.	29·508	0·802	80·0	39·1	40·9	69·6	50·8	18·8	58·6	51·4	·379	4·3	1·2	83	527	136·9	40·2	–	9	6	8	8	3·5	5·7	15	2·32
		Sept.	29·390	0·936	76·6	30·2	46·4	63·6	47·8	15·8	54·7	49·5	·352	4·0	0·9	82	528	124·6	34·7	–	5	0	7	18	2·5	6·6	16	1·08
CHISLEHURST (Heathfield Lodge, Kent), FRANCIS NUNES, Esq., M.A., F.M.S.	295	July	29·609	0·622	92·2	43·4	48·8	79·8	53·8	26·0	64·9	56·5	·457	5·0	1·8	74	527	132·7	48·8	–	5	3	10	13	–	–	13	2·57
		Aug.	29·641	0·801	83·6	41·5	42·1	72·6	51·4	21·2	60·4	53·2	·404	4·6	1·3	77	532	125·7	47·5	–	6	10	6	9	–	–	14	2·43
		Sept.	29·525	0·853	83·2	33·0	50·2	69·4	48·8	20·6	58·0	50·2	·365	4·1	1·9	76	534	120·1	43·3	–	3	1	7	19	–	–	15	1·54
ROYAL OBSERVATORY (Kent), THE ASTRONOMER ROYAL.	159	July	29·759	0·873	90·9	47·0	43·9	78·2	54·8	23·4	65·0	57·5	·473	5·3	1·5	78	524	137·3	47·4	0·1	5	5	10	11	–	6·1	16	2·36
		Aug.	29·800	0·842	81·7	45·0	36·7	72·9	52·5	20·4	61·0	53·6	·412	4·5	1·5	75	529	127·4	46·2	0·2	7	8	7	9	–	6·2	10	2·70
		Sept.	29·681	0·948	81·4	34·5	46·9	68·2	49·1	19·1	57·4	50·8	·371	4·2	1·1	79	531	114·8	41·9	0·5	2	1	8	19	–	6·4	11	1·39
THE GUILDHALL (London), WILLIAM HAYWOOD, Esq.		June	–	0·509	84·0	48·0	36·0	69·4	55·6	13·8	61·3	52·8	·390	4·4	1·6	74	526	–	–	–	–	–	–	–	–	–	13	1·70
		July	–	0·572	88·0	51·0	37·0	75·4	60·5	14·9	66·5	55·3	·437	4·8	2·3	68	521	–	–	–	–	–	–	–	–	–	12	3·11
		Aug.	–	0·803	78·0	52·6	25·4	70·3	57·5	12·8	62·0	52·3	·394	4·3	1·9	71	527	–	–	–	–	–	–	–	–	–	11	2·38
		Sept.	–	0·973	77·0	42·0	35·0	65·9	54·8	11·1	59·7	51·4	·380	4·3	1·4	74	527	–	–	–	–	–	–	–	–	–	13	1·87
STREATLEY VICARAGE (Berks), REV. J. SLATTER, M.A., F.R.A.S.	150	July	29·805	0·485	88·2	43·8	44·4	73·1	51·1	22·0	62·0	56·2	·453	5·1	1·1	82	528	87·5	–	1·2	5	2	10	14	–	4·7	12	4·94
		Aug.	29·857	0·796	84·3	41·8	42·5	72·1	50·4	21·7	60·0	54·6	·423	4·7	1·1	83	530	82·7	–	1·6	7	9	6	9	–	5·7	18	2·07
		Sept.	29·753	0·916	81·2	35·6	45·6	65·8	47·8	18·0	56·8	50·3	·368	4·0	1·1	78	533	75·2	–	1·9	7	1	6	16	–	5·7	13	0·95
ST. JOHN'S COLLEGE, BATTERSEA, REV. J. P. FAUNTHORPE, M.A., F.R.G.S.	13	July	29·833	0·932	87·5	45·0	42·5	75·4	53·0	22·4	62·8	58·1	·483	5·3	1·0	84	527	101·2	47·8	1·4	–	–	–	–	–	6·0	12	2·56
		Aug.	29·917	0·816	82·0	42·0	40·0	71·0	50·8	20·2	59·4	51·9	·387	4·3	1·4	76	533	99·0	44·7	1·7	2	3	15	11	–	5·7	13	1·69
		Sept.	29·841	0·887	82·0	31·0	51·0	65·7	47·5	18·2	56·3	49·0	·349	4·0	1·1	76	535	92·5	40·8	1·7	0	0	16	14	–	6·3	10	1·89
CAMDEN TOWN (London), G. J. SYMONS, Esq., F.M.S.	123	July	29·800	0·530	92·3	47·2	45·1	78·5	56·6	21·9	64·3	56·5	·457	5·0	1·6	75	525	120·8	54·6	–	7	2	7	15	–	5·4	13	2·57
		Aug.	29·838	0·823	83·0	43·4	39·6	72·6	52·8	19·8	61·4	53·2	·405	4·5	1·6	75	529	111·1	51·9	–	10	4	7	10	–	4·8	12	2·05
		Sept.	29·720	0·878	83·1	33·0	50·1	67·9	49·9	18·0	57·9	49·6	·355	4·0	1·3	73	531	103·9	47·4	–	2	0	10	18	–	5·0	13	1·64
CHISWICK (London), THISELTON DYER, Esq.	23	July	29·911	0·571	90·5	44·0	46·5	77·3	53·6	23·7	63·5	57·1	·467	5·1	1·4	79	528	140·4	48·9	–	6	6	10	9	–	–	13	1·87
		Aug.	29·945	0·890	83·0	39·5	43·5	72·2	50·9	21·3	60·4	53·2	·404	4·6	1·3	77	532	125·8	47·2	–	9	6	8	8	–	–	13	1·82
		Sept.	29·844	0·926	83·4	28·6	54·8	67·4	48·1	19·3	57·0	49·1	·349	3·9	1·3	75	534	116·4	43·0	–	2	2	14	13	–	–	10	1·31
OXFORD (Oxfordshire), REV. R. MAIN, M.A., F.R.S., F.R.A.S.	210	July	29·700	0·532	85·3	45·1	40·2	74·6	55·1	19·5	63·8	55·5	·441	4·9	1·5	75	525	123·4	47·8	0·7	5	5	12	9	2·0	6·9	14	2·97
		Aug.	29·749	0·831	79·2	42·8	36·4	69·7	52·3	17·4	59·8	51·9	·387	4·4	1·2	76	530	121·1	46·9	0·8	8	6	7	10	3·0	7·1	11	1·16
		Sept.	29·617	0·944	78·2	34·7	43·5	65·1	50·1	15·0	56·7	49·6	·355	4·0	1·2	77	531	117·0	45·2	1·2	4	0	10	16	2·2	7·3	15	0·97
GLOUCESTER (Gloucester), E. TOLLER, Esq., M.D.	100	July	29·898	0·544	89·2	42·2	47·0	78·0	56·2	21·8	65·0	56·4	·456	5·0	1·8	75	526	123·2	55·5	0·4	7	4	6	14	5·2	5·3	11	5·22
		Aug.	29·890	0·882	83·2	43·7	39·5	73·3	53·3	20·0	61·8	53·3	·407	4·5	1·6	74	530	115·0	52·6	0·8	7	7	8	9	3·1	5·2	11	2·76
		Sept.	29·774	0·995	78·2	34·0	44·2	66·5	51·1	15·4	58·0	51·9	·388	4·3	1·1	80	532	104·0	50·9	0·9	6	2	7	15	1·1	6·4	11	2·15
ROYSTON (Hertfordshire), HALE WORTHAM, Esq., F.R.A.S., F.M.S.	269	July	29·659	0·537	91·5	43·4	48·1	78·7	54·4	24·3	63·7	56·9	·465	5·1	1·4	79	523	–	–	–	–	–	–	–	–	5·5	15	2·75
		Aug.	29·719	0·829	86·6	44·8	41·8	73·2	51·0	22·2	60·5	53·6	·411	4·5	1·4	78	528	–	–	–	9	7	6	9	–	5·6	11	1·95
		Sept.	29·590	0·891	83·1	35·9	47·2	67·2	49·3	17·9	56·4	49·5	·355	4·0	1·0	78	530	–	–	–	–	–	–	–	–	5·9	10	0·88
CARDINGTON (near Bedford), Mr. MACLAREN, Assistant to S. C. WHITBREAD, Esq., F.R.S.	100	July	29·833	0·535	88·4	44·0	44·4	77·4	54·8	22·6	65·1	56·5	·458	5·1	1·7	74	525	108·6	47·8	0·6	7	4	12	8	–	4·5	16	4·20
		Aug.	29·881	0·795	79·4	42·0	37·4	70·9	51·7	19·2	60·3	54·7	·427	4·8	1·1	82	531	103·8	44·2	0·8	8	9	5	9	–	5·4	15	3·00
		Sept.	29·740	0·908	78·4	32·0	46·4	66·0	48·2	17·8	56·5	51·6	·384	4·3	0·8	84	533	87·4	41·6	1·1	4	1	9	16	–	5·2	10	1·15
LEAMINGTON (Warwickshire), S. URWICK JONES, Esq., F.M.S.	195	July	29·716	0·507	88·0	45·5	42·5	75·5	56·0	19·5	63·7	55·4	·441	4·9	1·6	75	525	–	–	0·1	3	7	9	12	–	5·1	15	4·40
		Aug.	29·760	0·851	82·2	46·7	35·5	73·3	53·5	19·8	60·8	51·9	·385	4·3	1·6	72	529	–	–	0·7	8	7	5	11	–	5·4	11	3·44
		Sept.	29·698	0·897	77·0	36·0	41·0	64·4	49·6	14·9	60·7	54·2	·420	4·7	1·2	79	526	–	–	0·8	6	0	6	18	–	6·4	15	1·63

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1872. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean. Of all Highest.	Temperature of Air in Month. Mean. Of all Lowest.	Temperature of Air in Month. Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	July	29·870	0·519	83·4	32·2	51·2	74·1	54·9	19·3	63·3	58·2	·486	5·4	1·1	83	528	114·2	47·4	1·0	5	8	13	5	6·3	4·0	13	3·36
		Aug.	29·920	0·930	74·0	46·1	27·9	69·5	53·1	16·4	60·0	54·9	·432	4·8	1·0	84	532	—	45·5	1·0	8	9	7	7	7·3	5·7	12	2·20
		Sept.	29·746	0·910	79·2	31·8	47·4	63·8	49·0	14·8	55·8	50·4	·367	4·1	0·9	83	534	—	40·7	1·2	5	1	7	17	6·0	5·0	16	1·90
NORWICH (Norfolk), C. M. Gibson, Esq., F.M.S.	42	July	29·870	0·506	86·5	41·8	44·7	75·7	55·1	20·6	64·1	55·7	·463	4·9	1·7	74	527	—	—	—	6	6	12	7	—	—	14	3·04
		Aug.	29·865	0·777	75·5	46·0	29·5	68·4	51·8	16·6	59·1	53·0	·403	4·6	1·1	80	532	—	—	—	9	7	6	9	—	—	12	2·72
		Sept.	29·753	0·926	75·0	32·0	43·0	63·7	48·8	14·9	55·8	50·6	·369	4·1	0·9	84	534	—	—	—	2	1	11	16	—	—	16	2·23
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	July	29·895	0·518	87·3	44·7	42·6	75·6	55·6	20·0	64·5	57·5	·476	5·2	1·5	79	527	124·7	52·7	0·4	5	8	10	8	—	5·4	16	5·93
		Aug.	29·941	0·784	79·3	43·0	36·3	70·5	52·3	18·2	60·2	54·2	·420	4·7	1·2	81	532	118·2	49·7	0·5	8	8	7	8	—	6·4	13	4·48
		Sept.	29·778	0·908	77·0	34·0	43·0	65·0	49·4	15·6	56·3	51·8	·387	4·3	0·7	85	534	108·1	46·5	0·8	1	2	11	16	—	6·3	17	2·49
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	July	29·816	0·463	83·7	47·1	36·6	71·8	54·9	16·9	61·5	54·6	·427	4·7	1·4	78	529	—	—	0·4	6	5	4	16	—	5·4	12	3·46
		Aug.	29·851	0·839	86·0	46·8	39·2	69·6	53·9	15·7	60·5	52·5	·395	4·1	1·7	73	531	—	—	0·5	2	6	9	14	—	5·5	15	2·15
		Sept.	29·674	0·778	79·6	43·6	36·0	63·4	52·1	11·3	57·2	49·1	·349	3·9	1·3	74	531	—	—	1·1	8	2	4	16	—	7·2	22	6·83
DERBY (Derbyshire), John Davis, Esq.	174	July	29·708	0·522	86·0	46·0	40·0	73·5	56·2	17·3	63·3	55·4	·439	4·9	1·6	76	525	—	—	—	7	3	12	9	—	—	18	4·68
		Aug.	29·754	0·795	80·0	46·0	34·0	68·2	53·1	15·1	59·5	52·9	·401	4·5	1·2	79	530	—	—	—	7	9	7	8	—	—	17	3·34
		Sept.	29·586	0·876	74·0	37·0	37·0	62·7	50·4	12·3	55·3	51·0	·375	4·2	0·8	88	531	—	—	—	3	2	7	18	—	—	19	2·93
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	241	July	29·641	0·534	88·7	43·0	45·7	77·3	54·4	22·9	64·2	56·4	·456	5·0	1·6	76	523	128·4	46·3	0·3	6	4	9	12	3·0	5·2	16	5·71
		Aug.	29·695	0·710	82·0	43·3	38·7	71·2	51·5	19·7	59·7	51·8	·386	4·3	1·4	75	529	118·9	43·5	0·6	8	9	6	8	1·1	5·8	12	2·93
		Sept.	29·518	0·857	78·1	35·0	43·1	65·6	48·9	16·7	56·4	49·3	·352	4·0	1·0	77	531	108·4	40·6	0·7	2	2	10	16	6·0	1·8	19	2·34
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	30	June	29·826	0·904	80·0	35·0	45·0	66·8	48·9	17·9	57·0	49·3	·351	3·9	1·3	75	534	134·7	43·5	1·6	6	3	12	9	—	5·3	12	1·65
		July	29·866	0·512	85·8	39·6	46·2	73·2	54·4	18·8	62·9	58·1	·481	5·3	0·9	86	528	137·1	48·0	0·9	11	6	11	3	—	5·9	12	3·42
		Aug.	29·921	0·755	76·5	42·2	34·3	66·6	51·6	15·0	56·5	50·5	·368	4·1	1·0	80	536	131·5	45·5	1·2	8	7	11	5	—	5·9	15	5·51
		Sept.	29·735	0·912	75·4	35·6	39·8	63·7	49·5	14·2	56·2	49·6	·357	4·0	1·1	79	533	112·6	43·1	1·5	4	0	17	9	—	6·2	15	2·65
HAWARDEN (Flint), T. Moffat, Esq., M.D., F.R.A.S.	270	July	29·623	0·522	85·0	51·0	34·0	72·0	58·8	13·2	63·0	57·1	·467	5·1	1·2	81	524	135·2	34·7	2·0	10	3	6	12	0·5	6·3	18	6·76
		Aug.	29·669	0·892	79·0	51·0	28·0	67·6	55·5	12·1	60·1	54·3	·422	4·7	1·1	81	528	122·3	32·7	2·0	6	6	11	8	0·7	5·0	17	2·40
		Sept.	29·491	0·845	74·0	41·0	33·0	61·3	52·7	8·6	55·7	49·5	·356	4·0	0·9	80	529	103·9	31·8	2·6	7	1	8	14	1·1	6·6	25	4·88
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	July	29·721	0·496	82·5	50·0	32·5	70·5	55·7	14·8	61·6	55·5	·440	4·9	1·2	81	527	—	—	0·9	4	5	10	12	—	6·0	16	7·54
		Aug.	29·755	0·870	79·0	49·8	29·2	68·4	53·7	14·7	59·4	53·0	·402	4·5	1·2	80	530	—	—	1·0	3	10	10	8	—	5·5	16	2·16
		Sept.	29·585	0·849	73·2	41·7	31·5	62·5	51·6	10·9	55·9	50·7	·372	4·2	0·8	83	531	—	—	1·7	5	3	8	14	—	6·6	24	6·48
ECCLES, near Manchester, T. Mackereth, Esq., F.R.A.S., F.M.S.	145	July	29·703	0·516	85·7	42·2	43·5	73·0	53·9	19·1	62·0	55·5	·441	4·9	1·3	79	527	89·3	46·4	0·2	7	6	8	10	1·3	4·2	15	7·33
		Aug.	29·794	0·828	83·5	46·0	37·5	69·5	51·1	18·4	59·3	52·7	·399	4·5	1·2	79	535	83·8	43·0	0·2	6	9	6	10	2·0	5·3	20	2·99
		Sept.	29·615	0·860	74·5	34·1	40·4	62·7	48·9	13·8	55·1	48·4	·342	3·8	1·1	79	532	73·0	41·3	0·4	4	2	9	15	2·8	6·2	25	6·58
MOOR SIDE OBSERVATORY, HALIFAX, (Yorkshire), Louis J. Crossley, Esq., F.M.S.	429	July	29·353	0·273	86·5	41·5	45·0	72·1	53·0	19·1	60·8	54·2	·437	4·7	1·2	79	521	119·5	48·3	0·9	6	10	5	10	0·6	4·8	14	4·24
		Aug.	29·405	0·818	78·0	43·0	35·0	67·2	49·9	17·3	56·5	52·2	·392	4·4	0·7	86	527	112·2	47·0	0·9	6	11	5	9	0·9	5·7	18	4·20
		Sept.	29·220	0·874	74·0	35·0	39·0	62·4	47·1	15·3	53·2	49·6	·355	4·0	0·5	88	527	105·1	44·1	1·5	7	3	6	14	1·8	6·0	25	5·53
PARK ROAD OBSERVATORY (Halifax, Yorkshire), Edward Crossley, Esq., F.R.A.S.	618	July	29·253	0·528	85·0	41·7	43·3	69·4	50·3	19·1	59·1	50·5	·369	4·2	1·4	73	522	109·4	—	0·3	5	8	5	12	—	5·6	13	2·77
		Aug.	29·298	0·855	80·0	42·5	37·5	66·4	49·9	16·5	56·3	50·3	·365	4·1	0·9	80	525	103·2	—	0·3	4	12	5	9	—	7·0	16	4·56
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	July	29·914	0·550	86·0	44·0	42·0	73·1	52·5	20·6	61·3	56·3	·453	5·0	1·0	84	530	101·5	49·8	—	—	—	—	—	2·6	—	11	4·84
		Aug.	29·951	0·740	77·0	41·0	36·0	67·9	50·0	17·9	57·8	53·3	·407	4·5	0·8	79	535	92·7	47·9	—	—	—	—	—	2·6	—	14	2·24
		Sept.	29·733	0·951	76·0	32·0	44·0	62·9	47·8	15·1	54·4	49·8	·358	4·0	0·8	85	535	87·7	46·2	—	—	—	—	—	3·1	—	20	3·65
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	381	July	29·474	0·528	83·8	42·0	41·8	71·3	53·3	18·0	60·4	54·8	·420	4·9	1·0	82	524	129·2	50·4	—	4	6	4	17	—	6·8	21	4·49
		Aug.	29·505	0·834	78·8	46·9	31·9	67·9	51·8	16·1	56·3	52·8	·400	4·4	1·0	81	527	121·5	48·7	—	7	9	5	10	—	7·0	21	5·57
		Sept.	29·299	0·857	74·0	35·1	38·9	61·4	49·2	12·2	54·1	48·6	·343	3·9	0·8	81	528	110·2	45·0	—	4	1	6	19	—	7·2	29	6·85

F.G.S.		Sept.	29·297	0·877	73·8	33·5	40·3	63·8	51·1	12·7	56·2	48·4	·342	3·9	1·2	75	525	83·1	–	1·0	–	–	–	–	–	5·1	20	3·92
LEEDS PHILOSOPHICAL HALL (Yorkshire). Louis C. Miall, Esq.	137	July	29·755	0·444	93·0	47·0	46·0	76·5	54·9	21·6	64·1	52·9	·402	4·5	2·1	67	525	85·0	–	1·3	5	6	9	11	–	6·0	12	5·59
		Aug.	29·808	0·829	86·0	45·0	41·0	71·2	52·2	19·0	60·3	50·8	·371	4·2	1·7	70	530	83·9	–	1·2	6	9	7	9	–	7·3	18	2·23
		Sept.	29·599	0·879	75·0	36·0	39·0	64·4	49·1	15·3	55·8	49·6	·358	4·0	0·9	81	531	77·7	–	1·7	7	1	6	16	–	6·9	22	4·08
YORK (Yorkshire). J. F. Fryer, Esq.	50	July	29·828	0·542	83·0	47·0	36·0	70·6	53·0	17·6	62·1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14	4·72
		Aug.	29·880	0·832	76·0	41·0	35·0	65·5	52·2	13·3	57·8	54·6	·427	4·6	0·7	89	534	–	–	–	4	12	10	5	–	–	15	2·64
		Sept.	29·644	0·853	72·0	37·0	35·0	60·4	49·1	11·3	54·3	52·3	·364	4·1	0·6	86	533	–	–	–	5	2	12	11	–	6·3	22	3·69
COCKERMOUTH (Cumberland). H. Dodgson, Esq., M.D., F.R.A.S., F.M.S.	148	July	29·751	0·694	84·1	41·4	42·7	70·2	54·6	15·6	61·1	52·7	·398	4·5	1·5	74	528	115·2	49·2	0·4	9	5	7	10	2·0	5·2	17	4·04
		Aug.	29·778	0·863	83·5	40·8	42·7	69·2	52·3	16·9	59·6	52·2	·389	4·4	1·3	77	530	109·2	46·1	0·4	6	9	8	8	1·6	6·8	17	3·88
		Sept.	29·559	0·918	77·8	31·5	46·3	61·9	49·6	12·3	54·7	48·1	·334	3·8	1·0	78	532	92·5	43·1	0·8	8	5	5	12	3·6	7·6	25	6·96
ALLENHEADS (Northumberland). Mr. S. Stobbs, Assistant to W. B. Beaumont, Esq., M.P.	1360	July	28·456	0·516	83·0	40·0	43·0	68·0	51·0	17·0	57·4	52·8	·400	4·5	0·8	85	509	114·3	48·6	0·3	–	–	–	–	–	5·8	18	4·14
		Aug.	28·486	0·806	74·0	37·5	36·5	61·2	47·1	14·1	53·2	49·2	·349	4·0	0·6	86	514	109·1	45·5	1·6	–	–	–	–	–	6·7	21	3·43
		Sept.	28·228	0·947	70·0	31·5	38·5	57·7	44·0	13·7	49·5	49·0	·348	4·0	0·0	98	531	91·7	41·7	0·2	–	–	–	–	–	7·0	27	6·02
SILLOTH RECTORY (Cumberland). Rev. Francis Redford, M.A., F.R.A.S., F.M.S.	28	July	29·879	0·484	81·3	42·3	39·0	72·2	53·6	18·6	61·0	54·8	·430	4·8	1·2	80	530	107·5	48·9	1·1	2	11	5	13	8·4	5·0	12	4·01
		Aug.	29·900	0·907	81·5	42·0	39·5	70·6	50·8	19·8	59·0	52·9	·401	4·5	1·1	80	533	105·3	46·4	1·0	3	16	8	9	8·4	4·8	17	3·01
		Sept.	29·676	0·970	75·9	34·5	41·4	63·6	48·4	15·2	55·0	49·1	·349	3·9	1·0	81	533	93·4	44·6	1·4	4	3	5	18	9·0	6·8	25	5·52
CARLISLE (Cumberland). J. Cartmell, Esq., F.M.S.	114	July	29·804	0·525	82·3	40·1	42·2	71·3	51·8	19·5	60·0	55·1	·435	4·8	0·9	80	530	105·9	48·5	1·4	6	7	5	13	5·1	5·5	15	3·80
		Aug.	29·814	0·888	81·4	39·3	42·1	68·9	48·9	20·0	58·0	51·4	·380	4·3	1·1	79	533	99·8	45·3	1·4	6	8	7	10	5·1	6·3	21	3·50
		Sept.	29·580	0·958	77·3	31·6	45·7	61·6	46·3	15·3	52·9	48·1	·387	3·8	0·7	85	534	85·9	45·6	2·1	4	5	5	16	6·8	7·1	25	4·74
BYWELL (Northumberland). Mr. John Dawson, Assistant to W. B. Beaumont, Esq., M.P.	87	June	29·681	0·968	76·0	44·0	32·0	67·1	52·7	14·4	57·7	51·4	·375	4·2	1·1	78	529	92·4	46·0	1·2	5	3	4	18	–	4·5	22	2·57
		July	29·788	0·509	83·0	46·0	37·0	70·0	56·7	13·3	61·5	51·3	·377	4·2	1·9	69	531	101·8	50·8	1·1	6	10	3	12	–	4·0	15	4·60
		Aug.	29·838	0·770	80·0	48·0	32·0	67·6	55·0	12·6	59·0	51·6	·383	4·3	1·3	77	532	87·4	49·3	0·1	–	–	–	–	–	5·2	17	4·18
		Sept.	29·560	1·007	72·0	37·0	35·0	60·0	48·0	12·0	52·6	46·0	·311	3·6	1·0	79	534	71·5	41·4	1·5	–	–	–	–	–	4·8	24	5·20
NORTH SHIELDS (Northumberland). Robert Spence, Esq.	124	July	29·822	0·485	81·0	46·8	34·2	66·1	53·9	12·2	58·9	51·5	·382	4·2	1·4	76	532	–	52·6	1·4	9	7	6	9	–	5·6	18	2·39
		Aug.	29·878	0·903	72·2	45·2	27·0	61·5	52·2	9·3	55·8	50·4	·367	4·1	0·9	83	536	–	51·0	1·6	8	7	8	8	–	6·3	21	3·71
		Sept.	29·618	0·947	70·0	35·8	34·2	58·6	48·0	10·6	52·7	46·8	·320	3·6	0·9	80	535	–	46·3	2·1	12	2	4	12	–	5·6	20	4·79
MILTOWN (Banbridge, Ireland). John Smyth, Esq., jun., M.A., M.I.C.E.I.	200	July	29·673	0·449	74·0	42·0	32·0	68·7	52·2	16·5	59·1	52·4	·395	4·5	1·1	79	529	113·9	50·8	1·4	11	5	9	6	2·4	4·2	11	3·31
		Aug.	29·707	0·895	72·0	39·0	33·0	65·7	51·5	14·2	57·6	50·8	·376	4·2	1·1	79	531	106·6	50·0	2·0	8	8	9	6	2·4	4·9	15	4·21
		Sept.	29·424	0·919	73·0	35·0	38·0	60·3	48·0	12·3	53·6	48·5	·339	3·8	0·8	82	530	94·9	44·7	2·4	4	4	10	12	3·6	5·6	28	4·37
CULLODEN (Inverness, Scotland). A. Forbes, Esq., F.M.S.	104	July	29·814	0·626	74·2	46·7	27·5	62·3	54·4	7·9	58·2	52·8	·406	4·5	0·9	82	532	101·1	47·6	0·3	5	8	6	12	8·2	6·5	18	3·14
		Aug.	29·835	0·827	65·2	46·5	18·7	59·9	52·4	7·5	56·1	51·3	·381	4·2	0·8	84	535	95·4	44·1	0·2	7	11	5	8	7·7	6·4	16	2·41

Note.—*The Barometer Reading*, St. John's College, Battersea, July 22d, 3 h. P.M., 29·020 inches has been altered to 30·020 inches; and on July 23d, 3 h. P.M., 28·880 inches has been altered to 29·880 inches.
August.—Weybridge Heath. The values are deduced from 23 days observations, viz., 9th to 31st.
August.—Bywell. The values are deduced from 25 days observations, viz., 1st to 25th.
September. " " " 22 days, viz., 9th to 30th.

Second Rain-gauges are placed—

			July.		August.		September.		Total during the Quarter.
At Eastbourne, at the height of	160 feet	*above the sea*, the amount collected was	1·98 inches.	-	2·07 inches.	-	2·01 inches.	-	6·01 inches.
" Beachy Head, "	610 feet	" "	1·62 "	-	1·07 "	-	1·62 "	-	4·31 "
" Portsmouth, "	20 feet	*above the ground* "	3·50 "	-	1·55 "	-	1·79 "	-	6·84 "
" Strathfield Turgiss, "	38 feet	" "	2·90 "	-	1·22 "	-	0·93 "	-	5·05 "
" Eccles, Manchester, "	34 feet	" "	6·95 "	-	2·61 "	-	5·71 "	-	15·27 "
" Allenheads, "	6½ feet	" "	4·41 "	-	3·65 "	-	6·55 "	-	14·61 "
" Carlisle, "	8 feet	" "	4·04 "	-	3·10 "	-	2·31 "	-	9·45 "
" Miltown, Ireland, "	40 feet	" "	3·31 "	-	3·86 "	-	4·17 "	-	11·34 "
" Brighton, "	35 feet	" "	1·24 "	-	1·47 "	-	1·16 "	-	3·87 "
" Radcliffe Observatory, "	22 feet	" "	3·18 "	-	1·07 "	-	0·86 "	-	5·11 "
" Marlborough College, "	8 inches	" "	2·54 "	-	2·24 "	-	1·08 "	-	5·86 "
" " "	1 foot	" "	2·56 "	-	2·28 "	-	1·06 "	-	5·90 "
" Cardington, "	36 feet	" "	3·80 "	-	2·60 "	-	0·85 "	-	7·25 "
" Boston, "	6 feet	" "	— "	-	— "	-	— "	-	— "
" Nottingham, "	25½ feet	" "	5·68 "	-	2·94 "	-	2·14 "	-	10·76 "
" Wisbech, "	8 feet	" "	5·66 "	-	4·49 "	-	2·43 "	-	12·58 "
" Aldershot Camp, "	25 feet	" "	2·38 "	-	1·93 "	-	1·27 "	-	5·58 "
" Cockermouth, "	6½ feet	" "	3·79 "	-	3·59 "	-	6·60 "	-	13·98 "
" Holkham, "	4 feet	" "	3·42 "	-	6·23 "	-	2·65 "	-	12·30 "

The rain-fall on Beachy Head in April was 0·70 in., in May was 2·21 in., and in June 4·21 in.

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	WIND. Mean Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	RAIN. Number of Days on which it fell.	Amount collected.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
Guernsey	29·533	78·5	41·5	37·0	65·6	56·5	26·5	9·1	60·1	54·3	·421	4·7	1·0	81	529	—	—	1·1	5	5	8	12	3·8	3·6	41	[illegible]
Helston	29·549	84·0	35·0	49·0	69·5	57·0	36·3	12·5	61·6	54·2	·422	4·8	1·5	77	527	97·2	49·7	2·1	5	4	10	12	4·3	5·0	47	[illegible]
Truro	29·569	83·0	31·0	52·0	67·8	54·3	37·6	13·5	59·1	52·2	·398	4·4	1·2	78	533	—	—	2·5	8	6	6	11	—	6·2	47	[illegible]
Sidmouth	29·525	75·2	35·2	40·0	66·2	53·5	29·3	12·7	59·1	55·4	·440	4·9	0·7	88	533	—	—	1·1	6	2	9	14	—	2·8	48	[illegible]
Osborne	29·504	87·1	34·0	53·1	72·2	53·3	31·4	18·9	61·1	55·9	·447	5·0	1·0	83	528	107·8	51·5	0·7	4	5	11	11	—	3·6	40	[illegible]
Portsmouth	29·539	81·6	33·0	48·6	71·2	51·2	38·5	20·0	60·2	51·8	·387	4·3	1·5	75	533	116·5	45·7	1·5	3	5	10	12	2·7	5·8	45	[illegible]
Worthing	29·507	78·0	35·1	42·9	69·0	55·0	31·4	14·0	60·8	54·2	·421	4·6	1·2	79	531	130·3	49·4	1·0	5	4	8	14	5·5	4·9	32	5·12
Brighton	29·514	81·8	37·7	44·1	68·7	55·1	32·6	13·6	60·6	54·8	·426	4·7	1·2	81	528	115·2	50·7	1·1	5	4	8	14	0·8	5·5	38	5·31
Lymington	29·561	84·2	31·0	53·2	70·1	53·6	42·0	16·5	61·9	51·0	·377	4·1	2·0	68	530	—	—	0·7	5	5	9	12	—	4·5	32	[illegible]
Wilton House	29·499	88·0	29·0	59·0	73·1	49·9	46·5	23·2	60·1	54·7	·430	4·8	1·0	82	528	114·8	48·2	1·3	7	1	14	8	3·9	5·5	34	[illegible]
Barnstaple	29·501	89·0	35·5	53·5	69·4	54·6	39·3	14·8	61·2	54·4	·425	4·7	1·3	79	530	—	—	1·3	2	3	13	12	—	3·6	55	14·31
Aldershot Camp	29·439	88·4	35·4	53·0	73·6	52·7	40·3	20·9	61·0	55·8	·450	5·0	1·0	85	525	118·4	43·8	1·3	5	5	9	12	1·9	6·3	37	[illegible]
Strathfield Turgiss	29·525	89·0	30·2	58·8	72·8	50·5	46·8	22·3	60·4	52·9	·402	4·5	1·3	77	530	125·0	45·2	0·7	5	6	9	11	4·5	5·0	39	[illegible]
Marlborough College	29·558	83·3	30·2	53·1	68·4	50·4	43·1	18·0	58·2	51·6	·382	4·3	1·2	81	526	134·1	39·9	—	7	3	9	12	2·9	6·0	41	6·03
Royal Observatory	29·508	90·9	34·5	56·4	73·1	52·1	42·5	21·0	61·1	54·0	·419	4·7	1·4	77	528	126·5	45·2	0·3	5	5	8	13	—	6·2	37	[illegible]
The Guildhall	—	88·0	42·0	46·0	70·5	57·6	32·5	12·9	62·7	53·0	·403	4·5	1·9	71	525	—	—	—	—	—	—	—	—	—	36	[illegible]
Streatley Vicarage	29·549	88·2	35·6	52·6	70·3	49·8	44·2	20·5	59·6	53·7	·415	4·6	1·1	81	530	81·8	—	1·6	6	4	7	13	—	5·4	45	[illegible]
St. John's Battersea	29·472	87·5	31·0	56·5	70·7	50·4	44·5	20·3	59·5	53·0	·406	4·5	1·2	79	535	97·6	44·4	1·6	—	—	—	—	—	6·0	33	[illegible]
Camden Town	29·311	92·3	33·0	59·3	73·0	53·1	44·9	19·9	61·2	53·1	·405	4·5	1·5	71	528	111·9	51·3	—	6	2	8	14	—	5·1	[illegible]	[illegible]
Chiswick	29·517	90·5	28·6	61·9	72·3	50·9	48·2	21·4	60·3	53·1	·407	4·5	1·3	77	531	127·5	46·4	—	5	5	11	10	—	—	36	5·00
Oxford	29·529	85·3	34·7	50·6	69·8	52·5	40·0	17·3	60·1	52·3	·394	4·4	1·3	76	529	120·5	46·6	0·9	6	4	9	12	2·4	7·1	45	5·10
Gloucester	29·545	89·2	34·0	55·2	72·6	53·5	43·5	19·1	61·6	53·9	·417	4·6	1·5	76	529	114·1	53·0	0·7	7	4	7	13	2·5	5·6	36	[illegible]
Royston	29·521	91·5	35·9	55·6	73·0	51·6	45·7	21·4	60·2	53·3	·410	4·5	1·3	78	527	—	—	—	—	—	—	—	—	5·7	36	5·59
Cardington	29·502	88·4	32·0	56·4	71·4	51·6	42·8	19·8	60·6	51·3	·423	[illegible]	1·2	80	530	99·9	44·5	0·8	6	5	9	11	—	5·0	39	[illegible]
Leamington	29·499	88·0	36·0	52·0	71·1	53·0	39·7	18·1	62·7	53·8	·415	4·6	1·5	76	527	—	—	0·5	6	5	7	13	—	5·6	41	[illegible]
Somerleyton Rectory	29·417	83·4	31·8	51·6	69·1	52·3	42·2	16·8	59·7	54·5	·428	4·8	1·0	83	531	—	44·5	1·1	6	6	9	10	6·5	4·9	41	[illegible]
Norwich	29·462	86·5	32·0	54·5	69·3	51·9	39·1	17·4	59·7	53·1	·412	4·5	1·2	79	531	—	—	—	6	5	9	11	—	—	42	[illegible]
Wisbech	29·457	87·3	34·0	53·3	70·4	52·4	40·6	18·0	60·3	54·5	·428	4·7	1·1	82	531	117·0	49·6	0·6	5	6	9	11	—	6·0	46	[illegible]
Llandudno	29·497	86·0	43·6	42·4	68·3	53·0	37·3	14·7	59·7	52·1	·390	4·2	1·5	75	530	—	—	0·7	5	4	6	15	—	6·0	49	[illegible]
Derby	29·462	86·0	37·0	49·0	68·1	53·2	37·0	14·9	59·4	53·1	·405	4·5	1·2	81	529	—	—	—	6	5	9	11	—	—	49	[illegible]
Holkham	29·480	85·8	35·6	50·2	67·8	51·8	40·1	16·0	58·5	52·7	·402	4·5	1·0	82	532	127·1	45·5	1·2	8	4	13	6	—	6·0	42	[illegible]
Hawarden	29·455	85·0	41·0	44·0	67·0	55·7	31·6	11·3	59·6	53·6	·415	4·6	1·1	81	527	120·5	33·1	2·2	8	5	8	11	0·8	6·0	60	14·04
Liverpool	29·492	82·5	41·7	40·8	67·1	53·7	31·1	13·4	59·0	53·1	·405	4·5	1·1	81	529	—	—	1·2	4	6	9	11	—	6·0	51	16·18
Eccles	29·483	85·7	34·1	51·6	68·4	51·3	40·5	17·1	58·8	52·2	·394	4·4	1·2	79	531	82·0	43·6	0·3	6	6	7	12	2·0	5·2	60	16·85
Moorside Observatory	29·391	86·5	35·0	51·5	67·2	50·0	39·7	17·2	56·8	52·0	·395	4·4	0·8	84	525	112·3	46·5	1·1	6	8	5	11	1·1	5·5	57	13·97
Hull	29·477	86·0	32·0	54·0	68·0	50·1	40·7	17·9	57·8	53·1	·403	4·5	0·9	83	533	94·0	48·0	—	—	—	—	—	2·8	—	45	[illegible]
Stonyhurst	29·441	83·8	35·1	48·7	66·9	51·4	37·5	15·5	57·6	52·1	·391	4·4	0·9	81	526	120·3	48·3	—	5	5	5	15	—	7·0	71	18·91
Bradford	29·446	86·4	33·5	52·9	68·7	53·6	36·8	15·1	59·6	47·0	·349	4·1	1·6	72	526	92·0	—	0·8	—	—	—	—	—	4·3	45	[illegible]
Leeds	29·490	93·0	36·0	57·0	70·7	52·1	42·0	18·6	60·1	51·1	·377	4·2	3·6	73	529	82·2	—	1·4	6	5	7	12	—	6·7	[illegible]	[illegible]
York	—	83·0	37·0	46·0	65·5	51·4	35·3	11·1	58·1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	51	[illegible]
Cockermouth	29·475	84·1	31·5	52·6	67·1	52·2	43·9	14·9	58·5	51·0	·377	4·2	1·3	76	530	105·6	46·1	0·5	7	6	7	10	2·4	6·5	59	[illegible]
Allenheads	29·479	83·0	31·5	51·5	62·3	47·4	39·3	14·9	53·4	50·5	·366	4·2	0·5	90	518	105·0	45·3	0·7	—	—	—	—	—	6·5	66	[illegible]
Silloth	29·455	81·5	34·5	47·0	68·8	50·9	40·0	17·9	58·3	52·3	·393	4·4	1·1	80	532	102·1	46·6	1·2	3	10	4	13	8·0	5·5	54	[illegible]
Carlisle	29·453	82·3	31·6	50·7	67·3	49·0	43·3	18·3	57·0	51·5	·401	4·3	0·9	81	532	97·2	46·5	1·6	5	6	6	13	5·7	6·3	61	[illegible]
Bywell	29·464	83·0	37·0	46·0	65·9	53·2	34·6	12·7	57·7	49·6	·357	4·0	1·4	75	532	86·9	47·2	0·9	—	—	—	—	—	4·7	[illegible]	13·98
North Shields	29·548	81·0	35·8	45·2	62·1	51·4	31·8	10·7	55·8	49·6	·356	4·0	1·1	80	534	—	50·0	1·7	10	5	6	10	—	5·8	59	[illegible]
Miltown (Ireland)	29·443	74·0	35·0	39·0	64·9	50·6	34·3	14·3	56·8	50·6	·370	4·2	1·0	80	530	105·1	48·5	1·9	8	6	9	8	2·8	4·9	54	[illegible]

The highest temperatures of the air were at Leeds, 93°·0; Camden Town, 92°·3; Royston, 91°·5; Royal Observatory, 90°·9; Chiswick, 90°·5; Gloucester, 89°·2; and at Barnstaple and Strathfield Turgiss, 89°·0 respectively.

The lowest temperatures of the air were at Chiswick, 28°·6; Wilton House, 29°·0; Strathfield Turgiss and Marlborough College, 30°·2 respectively; and at Lymington and St. John's College, Battersea, 31°·0 respectively.

The greatest daily ranges of the temperatures of the air were at Wilton House, 23°·2; Strathfield Turgiss, 22°·3; Chiswick and Royston, 21°·4 respectively; and at the Royal Observatory, 21°·0.

The least daily ranges of the temperatures of the air were at Guernsey, 9°·1; North Shields, 10°·7; Hawarden, 11°·3; Helston, 12°·5; Sidmouth and Bywell, 12°·7 respectively; Guildhall, 12°·9; and at Liverpool, 13°·4.

The greatest numbers of rainy days were at Stonyhurst, 71; Allenheads, 66; Carlisle, 61; Hawarden and Eccles, 60 respectively; Cockermouth and North Shields 59 respectively; and at Halifax, 57.

The least numbers of rainy days were at Worthing and Lymington 32 respectively; Wilton House, 34; St. John's College, Battersea, 33; and at Chiswick, Guildhall, Gloucester, and Royston, 36 respectively.

The heaviest falls of rain were at Stonyhurst, 18·91 inches; Eccles, 16·85 inches; Liverpool, 16·18 inches; Cockermouth, 14·[illegible] inches; Barnstaple, 14·31 inches; Hawarden, 14·04 inches; Bywell, 13·98 inches; and at Halifax, 13·97 inches.

The least falls of rain were at Chiswick, 5·00 inches; Oxford, 5·10 inches; Worthing, 5·12 inches; Brighton, 5·31 inches; Royston, 5·59 inches; and at Marlborough College, 6·03 inches.

Quarterly Meteorological Table for different Parallels of Latitude.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	WIND. Mean Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	RAIN. Mean Number of Days it fell.	Mean Amount collected.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
Guernsey	29·533	78·5	41·5	37·0	65·6	56·5	26·5	9·1	60·1	54·3	·421	4·7	1·0	81	529	—	—	1·1	5	5	8	12	3·8	3·6	41	[illegible]
Between the latitudes 50° and 51°	29·536	81·9	34·0	47·9	69·3	54·1	44·9	15·2	60·5	53·7	·414	4·6	1·3	79	530	113·5	49·4	1·3	5	4	9	13	3·3	5·0	41	[illegible]
51° and 52°	29·514	88·5	32·6	55·9	71·6	51·7	44·2	19·3	60·1	53·5	·413	4·6	1·3	79	528	115·7	46·4	1·1	6	4	9	12	3·0	5·6	[illegible]	[illegible]
52° and 53°	29·476	87·0	35·3	51·7	69·3	52·1	40·5	17·4	59·1	53·5	·413	4·6	1·2	80	530	114·7	46·0	0·8	6	5	9	11	—	5·6	45	[illegible]
53° and 54°	29·461	85·2	36·2	49·6	67·7	52·1	37·2	15·6	58·6	51·8	·394	4·4	1·4	79	528	100·5	43·9	1·2	6	6	7	12	1·8	5·8	[illegible]	[illegible]
54° and 55°	29·465	82·8	33·2	49·6	67·3	50·5	40·2	15·8	57·0	50·9	·379	4·2	1·0	80	529	99·4	46·3	1·0	5	7	6	12	5·6	5·9	[illegible]	[illegible]
North Shields	29·548	81·0	35·8	45·2	62·1	51·4	31·8	10·7	55·8	49·6	·356	4·0	1·1	80	534	—	50·0	1·7	10	5	6	10	—	5·8	59	[illegible]
Miltown, Banbridge (Ireland)	29·443	74·0	35·0	39·0	61·9	50·6	34·3	14·3	56·8	50·6	·370	4·2	1·0	80	530	105·1	48·5	1·9	8	6	9	8	2·8	4·9	54	[illegible]
Mean for the Quarter 50° to 55° Year 1869	29·587	86·8	37·6	49·2	69·4	51·8	40·7	17·6	59·5	52·3	·393	4·3	1·3	77	531	107·1	43·8	1·2	6	5	7	13	4·5	5·4	[illegible]	[illegible]
" 1870	29·619	86·1	37·2	48·9	70·1	51·3	33·5	18·8	59·6	52·0	·390	4·3	1·4	76	531	108·5	44·6	1·0	8	6	6	11	3·7	4·7	[illegible]	[illegible]
" 1871	29·517	84·5	36·9	47·6	67·0	50·2	37·0	16·8	58·9	52·2	·394	4·4	1·2	79	530	108·7	46·8	1·0	5	6	8	12	4·0	5·5	[illegible]	[illegible]
" 1872	29·489	85·2	34·3	50·9	68·9	52·2	41·1	16·7	59·3	52·7	·403	4·5	1·2	79	529	108·7	46·4	1·1	6	5	8	12	3·4	5·6	[illegible]	[illegible]

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING DECEMBER 31, 1872.

Remarks on the Weather during the Quarter ending December 31st, 1872.

By James Glaisher, Esq., F.R.S., *&c.*

Till the 24th of October the weather was cold, notwithstanding a prevalence of S.W. and W.S.W. winds, and the average deficiency of daily temperature was 3°¾. A warm period set in on the 25th, and continued till November 9th, the average daily excess of mean temperature being 3°¼. From November 10th to November 19th was a steady cold period, with the wind from the N. and N.E., the average daily deficiency of temperature being 5°¼. On November 20th a period followed of as warm weather as that preceding was cold, the daily excess on the average of 14 days ending December 3rd, being 6°. The direction of the wind was from the S.W. and W.S.W. This was succeeded by a period of changing weather, there having been a few days with excess and a few days with defect, alternately, the latter rather predominating, as the mean daily departure for 16 days ending December 19th was 1°¼ below the average. On December 20th an extraordinary warm period set in and continued to the end of the year, the average daily excess for this period was more than 9°. The direction of the wind was almost constantly from the west. The mean temperature of the month of November was 2°¾ below that in October, and that of December was about 2°¼ below that of November, while the average decline at Greenwich from October to November is 7°¼, and from November to December is 3°¼. The mean decline from October to November from all stations was 2°¾, and from November to December was 2°½.

The mean temperatures of November and December were above their averages, but this fact was greatly due to high night temperature; the average low night temperature in November was 40°·8; since 1841 the instances of average low night temperature in this month exceeding 40°, were:

1863 when it was 40°·3;	1852 when it was 44°·1;	1847 when it was 40°·8
1857 „ 40°·6;	1850 „ 41°·0;	1848 „ 40°·3

Therefore back to 1841 there have been only six Novembers with nights so warm as in November 1872.

The mean night temperature in December was 38°·7, the previous instances to 1841 are:

1868 when it was 41°·1;	1862 when it was 38°·6;	1852 when it was 42°·4
1865 „ 38°·1;	1857 „ 39°·6;	1843 „ 40°·3
		1842 „ 40°·2

or 7 instances in all.

The readings of the barometer at 159 feet above the sea level were remarkably low throughout the quarter, the mean values for each month being:—October 29·533 in., November 29·511 in., and December 29·413 in., and the departures below the averages were 0·171 inches, 0·252, and 0·397 respectively. The ranges of readings in each month were, however, somewhat large, amounting to more than an inch in the first and last months and 1½ in. in November. It is very rarely that such a long period of continuous depression is experienced. In 1841 the mean for the corresponding quarter was about 29·5 in. but there has been no instance since that year of any approach to such low readings for so lengthened a time, though on several occasions the values for single months have been in defect of the number given above.

The principal movements during the quarter were as follows:—

	Inches.				Inches.		
An increase to	30·199	on Oct.	6;	A decrease to	29·156	on Oct.	10.
„	29·850	„	14;	„	29·123	„	16.
„	29·614	„	19;	„	29·036	„	24.
„	29·913	„	29;	„	29·144	Nov.	2.
„	30·211	Nov.	7;	„	29·531	„	10.
„	29·910	„	12;	„	29·008	„	23.
„	29·622	„	27;	„	28·704	„	30.
„	29·834	Dec.	5;	„	28·689	Dec.	10.
„	29·841	„	12;	„	29·178	„	17.
„	29·740	„	22;	„	28·971	„	25.
„	29·793	„	30;	„	29·397	„	31.

The most remarkable feature has been the frequency of rain. During the quarter it has fallen at Greenwich on 67 days, a greater number than had been previously experienced at Greenwich back to the year 1815. The total fall is large, amounting to 11·32 inches. The previous instances of large falls at Greenwich are as follows:—

Year.	Amount fallen.			Total fall in the Quarter.	Number of Days of Rain in			
	October.	November.	December.		Oct.	Nov.	Dec.	The Quarter.
	in.	in.	in.	in.				
1821 - -	2·42	4·33	4·72	11·47	11	20	19	50
1823 - -	3·60	3·66	2·26	9·52	12	16	6	34
1824 - -	2·44	3·88	3·55	9·87	12	14	17	43
1831 - -	3·65	2·70	3·47	9·82	19	15	19	53
1832 - -	4·41	4·48	2·08	10·97	16	15	16	47
1833 - -	2·87	2·51	4·95	10·33	13	11	27	51
1841 - -	5·84	2·75	1·92	10·51	22	13	18	53
1844 - -	4·01	4·74	0·34	9·09	15	13	6	34
1852 - -	3·75	5·66	1·72	11·13	15	22	19	56
1865 - -	5·90	2·39	0·87	9·16	19	18	10	47
1868 - -	2·59	1·16	5·45	9·20	13	12	23	48
1872 - -	4·33	2·02	4·07	11·32	22	24	21	67

The Table shows that the total fall in the quarter has been but once exceeded, viz., in the year 1821, when it was 11·47 inches or 0·15 greater; back to 1815, there is only one other instance of a fall exceeding 11 inches, viz., in 1852. The Table shows that in 58 years there have been 12 instances of the fall in the three months ending December exceeding 9 inches, of which six were between 9 and 10; three between 10 and 11, and three exceeding 11 inches. The number of days of rain are shown in the last column, they differ greatly, and all are less in number than in the quarter just closed. This unusual frequency of rain has been general over the country. At Stonyhurst in Lancashire, rain fell on every day in the quarter except two, and at Guernsey on 80 days, and the general average over the country was 67 days. The amount at Guernsey is very remarkable being as large as 25¼ inches. The average fall of rain from all the stations was 13·97 inches being more than double of the fall in the corresponding period of the year 1871, which was 6·09 inches. The smallest falls of rain at Greenwich in this quarter were in 1851, when it was 2·92 inches, and in 1871 when it was 3·17 inches, in both cases preceding the two heaviest falls.

The mean temperature of October was 47°·8, being 1°·8 lower than the average of the preceding 101 years; and lower than in any year back to 1850 when the value recorded was 47°·0.

The mean temperature of November was 45°·3, being 3°·0 higher than the average of the preceding 101 years, and higher than in any preceding year since 1863 (45°·7) and then again to 1857 (45°·8).

The mean temperature of December was 42°·9, being 3°·8 higher than the average of the preceding 101 years, higher than in the years 1869–71, but lower than in 1868 when 46°·0 was recorded.

The mean high day temperatures were respectively 1°·9 and 2°·0 higher than their averages in November and December, but 1°·8 lower in October.

The mean low night temperatures were higher than their averages in November and December by 3°·7 and 3°·2 respectively, but lower in October by 2°·7.

Therefore the days and nights were cold in October and warm in November and December.

The daily ranges of temperature were less than their respective averages in November and December by 1°·7 and 1°·2, but greater in October by 0°·8.

The fall of rain was 1·5 in., 0·6, and 2·1 in. in excess of the average in October, November, and December respectively.

The mean temperature of the air in the three months ending November, constituting the three autumn months, was 50°·2, being 0°·7 higher than the average for 101 years.

1872. Months.	Temperature of Air. Mean.	Air. Diff. from average of 101 years.	Air. Diff. from average of 31 years.	Evaporation. Mean.	Evaporation. Diff. from average of 31 years.	Dew Point. Mean.	Dew Point. Diff. from average of 31 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 31 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 31 years.	Weight of vapour in a Cubic Foot of Air. Mean.	Weight of vapour. Diff. from average of 31 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
Oct. -	47·8	−1·8	−2·5	46·5	−1·8	45·0	−1·2	15·6	+0·8	51·0	0·299	−0·015	3·4	−0·2
Nov. -	45·3	+3·0	+1·7	43·6	+2·3	41·7	+2·2	10·0	−1·7	46·0	0·264	+0·017	3·1	+0·3
Dec. -	42·9	+3·8	+2·7	41·4	+2·7	39·7	+2·8	8·3	−1·2	41·5	0·244	+0·023	2·8	+0·2
Mean -	45·3	+1·7	+0·6	43·8	+1·1	42·1	+1·3	11·3	−0·7	46·2	0·269	+0·008	3·1	+0·1

1872. Months.	Degree of Humidity. Mean.	Humidity. Diff. from average of 31 years.	Reading of Barometer. Mean.	Barometer. Diff. from average of 31 years.	Weight of a Cubic Foot of Air. Mean.	Weight. Diff. from average of 31 years.	Rain. Amount.	Rain. Diff. from average of 57 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
Oct. -	91	+ 4	29·533	−0·171	539	0	4·3	+1·5	234	10	14	7	25·4	49·0
Nov. -	87	− 1	29·511	−0·252	541	− 7	2·9	+0·6	416	6	19	5	26·8	45·2
Dec. -	88	0	29·413	−0·397	542	−10	4·1	+2·1	346	8	19	4	17·9	45·0
Mean -	89	+ 1	29·486	−0·273	541	− 6	Sum 11·3	Sum +4·2	Mean 332	Sum 24	Sum 52	Sum 16	Lowest 17·9	Highest 49·0

NOTE.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the plus sign (+) signifies above the average.

Thunderstorms occurred on the 2d of October at Streatley; on the 3d at London, Royston, Somerleyton, Norwich, and Carlisle; on the 4th at Guernsey and Brighton; on the 5th at Eastbourne; on the 9th at Liverpool; on the 11th at Guernsey, Taunton, Llandudno, and Liverpool; on the 17th at Guernsey; on the 25th at Holkham; and on the 26th at Osborne, Brighton, Somerleyton, and Cockermouth. On the 1st of November at York; on the 2d at York; on the 9th at Guernsey; on the 10th at Hawarden; on the 19th at Cockermouth; on the 24th at Truro, Llandudno, and Cockermouth; on the 25th at Oxford; on the 26th at Eastbourne, Osborne, Portsmouth, Brighton, and Lymington; and on the 30th at Sidmouth, Taunton, Aldershot Camp, Marlborough College, and Lampeter. On the 7th of December at Guernsey and Helston; on the 8th at Eastbourne; and on the 10th at Eastbourne.

Thunder was heard, but lightning was not seen, on the 2d of October at Streatley; on the 3d at Weybridge; on the 11th at Marlborough College and Hawarden; on the 24th at Guernsey; on the 26th at Portsmouth; on the 30th at Bywell; and on the 31st at Strathfield Turgiss. On the 2d of November at Truro; on the 9th at Halifax; on the 18th at Eastbourne; and on the 30th at Portsmouth and Wisbech. On the 25th of December at Bywell.

Lightning was seen, but thunder was not heard, on the 2d of October at Eastbourne and Carlisle; on the 3d at Brighton; on the 4th at Norwich; on the 5th at Osborne, Portsmouth, Brighton, Taunton, Lymington, Weybridge, and Oxford; on the 10th at Eastbourne; on the 11th at Eastbourne, Osborne, Brighton, Llandudno, and Stonyhurst; on the 12th at Eastbourne; on the 26th at Portsmouth, Aldershot Camp, Holkham, and Carlisle; and on the 31st at Hawarden, Eccles, Stonyhurst, York, and Carlisle. On the 1st of November at Guernsey, Oxford, and Silloth; on the 2d at Brighton; on the 9th at Oxford; on the 10th at Guernsey and Oxford; on the 17th at Brighton and Streatley; on the 25th at Guernsey, Truro, Oxford, Gloucester, and Llandudno; on the 26th at Truro, Bournemouth, Taunton, Oxford, Gloucester, and Llandudno; and on the 30th at Brighton and Salisbury. On the 1st of December at Hull; on the 2d at Guernsey; on the 8th at Salisbury; on the 9th at Eastbourne; and on the 24th at Liverpool and Silloth.

Solar halos were seen on the 1st of October at Brighton; on the 12th at Brighton; and on the 20th at Stonyhurst. On the 9th and 20th of November at Oxford. On the 2d of December at Salisbury and Oxford.

Lunar halos were seen on two occasions in October; three in November; and on eleven in December.

Auroræ Boreales were seen on the 3d of October at Silloth and North Shields; on the 6th and 7th at Brighton; on the 14th at Guernsey; on the 17th at Oxford and Carlisle; on the 28th at Oxford; and on the 31st at Brighton. On the 2d of November at Brighton; on the 11th at Cockermouth and Carlisle; on the 15th at Helston. On the 1st of December at Oxford; on the 2d at Cockermouth; on the 9th at Oxford; and on the 26th at Stonyhurst.

Snow fell on the 10th of October at Allenheads and on the mountains of Carlisle; on the 11th and 12th on the mountains of Carlisle. On the 9th of November on the neighbouring mountains of Carlisle; on the 10th at Brighton, Royston, Halifax, York, Allenheads, on the neighbouring mountains of Carlisle, Bywell, and North Shields; on the 11th at London, Royston, Cardington, and Allenheads; on the 12th at Streatley, Hull, and Allenheads; on the 13th at Brighton, Salisbury, Weybridge, Streatley, Oxford, Royston, Wisbech, Hawarden, Eccles, Halifax, Hull, Stonyhurst, Allenheads, on the neighbouring mountains of Carlisle, Bywell, and North Shields; on the 14th at Brighton, Lymington, Marlborough College, Streatley, and Allenheads; on the 15th at Allenheads; on the 16th at Marlborough College, Streatley, and Allenheads; on the 17th at Allenheads; on the 18th at Somerleyton; on the 19th and 20th at Allenheads; and on the 25th at Eastbourne. On the 4th of December at North Shields; on the 5th at Taunton, Liverpool, Stonyhurst, Bywell, and North Shields; on the 9th at Norwich; on the 10th at Eastbourne, Royston, and Silloth; on the 12th at Oxford, Llandudno, Liverpool, Eccles, Stonyhurst, and Bywell; on the 13th at Stonyhurst, Bywell, and North Shields; on the 16th at Hull, and at Bradford began to fall at 11h. P.M., and was nearly 15 inches deep by 8h. A.M.; and on the 17th at Stonyhurst, Cockermouth, Carlisle, and North Shields.

Hail fell on forty-four different days during the quarter.

Fog was prevalent at one or other place on fifty-four days during the quarter, but mostly in the north.

Field Elm divested of leaves on the 27th of October at Carlisle; and on the 30th at Strathfield, Turgiss, and Hull. On the 10th of November at Weybridge; on the 15th at Guernsey; and on the 23d at Oxford.

Wych Elm divested of leaves on the 26th of October at Hull; and on the 30th at Strathfield Turgiss.

Oak divested of leaves on the 7th of November at Hull; and on the 15th at Guernsey.

Lime divested of leaves on the 17th of October at Oxford; on the 25th at Guernsey and Somerleyton; on the 27th at Hull and Carlisle; and on the 2d of November at Weybridge.

Sycamore divested of leaves on the 16th of October at Strathfield Turgiss; on the 20th at Helston; on the 27th at Hull; on the 29th at Carlisle; on the 31st at Guernsey; and on the 2d of November at Weybridge.

Horsechestnut divested of leaves on the 22d of October at Hull; on the 26th at Oxford; on the 29th at Carlisle; and on the 31st at Guernsey. On the 1st of November at Weybridge.

Common Poplar divested of leaves on the 12th of October at Helston; and on the 31st at Carlisle. On the 9th of November at Hull.

Occidental Plane divested of leaves on the 9th of November at Hull.

Oriental Plane divested of leaves on the 13th of November at Hull.

Hawthorne divested of leaves on the 16th of October at Helston; and on the 24th at Hull. On the 4th of November at Weybridge.

Spanish Chestnut divested of leaves on the 31st of October at Carlisle.

Beech divested of leaves on the 25th of October at Guernsey.

Hazel divested of leaves on the 7th of November at Hull.

Walnut divested of leaves on the 26th of October at Hull; on the 29th at Carlisle; and on the 30th at Oxford.

Thrush heard singing on the 24th of December at Strathfield Turgiss.

Blackbird heard singing on the 27th of December at Strathfield Turgiss.

Woodcock arrived on the 26th of October at Lampeter.

Fieldfare arrived on the 4th of November at Brighton.

Swallow departed on the 2d of October from Llandudno; on the 3d from Brighton; on the 4th from Oxford; on the 9th from Helston; on the 13th from Wisbech; on the 16th from Weybridge and Hull; on the 22d from Hawarden; and on the 24th from Taunton. On the 9th of November from Osborne.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING DECEMBER 31st, 1872.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1872.	Pressure of Atmosphere in Month.		Temperature of Air in Month.						Mean Temperature.		Vapour.			Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer.		Wind.					Mean Amount of Ozone.	Mean Amount of Cloud.	Rain.	
		Months.	Mean.	Range.	Highest.	Lowest.	Range.	Mean: Of all Highest.	Mean: Of all Lowest.	Mean: Daily Range.	Air.	Dew Point.	Elastic Force.	In a cubic foot of Air: Mean.	In a cubic foot of Air: Short of Saturation.			Maximum in Rays of Sun.	Minimum on Grass.	Estimated Strength.	Relative Proportion of N.	E.	S.	W.			Number of Days it fell.	Amount collected.
	feet		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S.	204	Oct.	29·493	1·108	63·5	40·5	23·5	56·2	47·4	8·8	51·3	46·8	·322	3·6	0·6	85	534	—	—	1·3	5	4	12	10	4·2	5·9	27	11·04
		Nov.	29·501	1·576	58·5	37·0	21·5	52·1	45·6	6·5	48·7	44·6	·296	3·3	0·4	86	537	—	—	2·1	5	2	11	12	4·9	7·0	27	7·40
		Dec.	29·382	1·302	53·5	34·5	19·0	50·1	43·4	6·7	47·0	43·4	·281	3·3	0·4	88	537	—	—	1·9	3	5	14	9	4·5	7·1	26	6·80
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	105	Oct.	29·641	1·296	66·0	36·0	30·0	58·4	46·3	12·1	51·4	43·8	·286	3·4	1·0	77	532	71·4	40·9	2·2	10	1	7	13	5·5	6·0	23	7·15
		Nov.	29·609	1·792	62·0	36·0	26·0	54·3	45·7	8·6	49·9	42·5	·272	3·0	1·0	76	537	60·1	42·9	2·3	6	2	9	13	5·8	5·4	24	4·92
		Dec.	29·508	1·172	58·0	34·0	24·0	53·9	43·7	10·2	49·2	41·1	·258	3·2	1·0	75	535	58·0	40·6	2·2	6	2	10	13	5·8	6·7	23	5·78
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	Oct.	29·673	1·237	62·0	31·0	31·0	55·8	42·8	13·0	48·8	44·5	·295	3·3	0·5	85	540	—	—	2·5	10	2	8	11	—	6·2	25	5·67
		Nov.	29·671	1·766	58·0	33·0	25·0	52·2	43·3	8·9	47·3	44·6	·294	3·3	0·4	91	542	—	—	3·1	7	2	8	13	—	6·7	27	5·96
		Dec.	29·522	1·149	56·0	27·0	29·0	50·9	42·0	8·9	46·5	42·6	·274	3·1	0·6	87	540	—	—	2·7	6	3	9	13	—	7·5	25	6·13
SIDMOUTH (Devon), J. Ingleby Mackenzie, Esq., M.B., F.M.S.	30	Oct.	29·664	1·184	62·4	32·6	29·8	54·7	43·9	10·8	49·2	47·1	·324	3·8	0·3	93	539	—	—	1·3	6	5	4	16	—	3·2	23	4·82
		Nov.	29·680	1·613	60·7	25·5	35·2	51·0	41·3	9·7	46·3	43·6	·283	3·2	0·3	90	543	—	—	1·7	8	0	5	17	—	3·9	20	4·01
		Dec.	29·563	1·236	54·2	28·1	26·1	49·5	40·7	8·8	45·1	44·2	·291	3·3	0·6	96	542	—	—	1·7	5	2	8	16	—	4·8	25	5·50
EASTBOURNE (Sussex), Miss W. L. Hall.	12	Oct.	29·715	0·979	64·8	32·5	31·8	57·4	45·0	12·4	50·8	45·3	·294	3·4	0·8	79	539	81·4	38·0	0·5	3	5	10	13	4·7	—	24	5·69
		Nov.	29·724	1·354	58·2	32·2	26·0	51·1	42·8	8·3	47·1	43·5	·282	3·3	0·4	88	543	64·0	36·5	0·9	6	2	6	17	4·6	—	25	6·56
		Dec.	29·606	0·937	55·8	30·0	25·8	49·1	41·2	7·9	45·4	41·7	·263	3·0	0·5	87	543	58·2	35·9	0·6	3	4	12	12	3·7	—	20	6·21
OSBORNE (Isle of Wight), J. R. Mann, Esq.	172	Oct.	29·530	1·155	64·2	31·4	32·8	57·0	42·0	15·0	48·9	47·0	·323	3·6	0·4	94	537	75·2	41·0	0·1	5	5	11	10	—	6·3	21	5·88
		Nov.	29·538	1·498	58·2	31·0	27·2	51·1	40·4	10·7	45·5	42·9	·278	3·1	0·4	90	541	59·2	39·8	0·2	4	1	14	11	—	7·1	23	5·46
		Dec.	29·418	1·235	55·1	26·2	28·9	48·5	38·8	9·7	43·9	41·2	·260	3·0	0·3	91	541	52·4	37·5	0·1	4	4	16	7	—	7·2	23	5·00
BOURNEMOUTH (Hants), T. A. Compton Esq., M.D., B.A., F.M.S.	128	Oct.	29·699	1·120	61·2	31·8	29·4	54·8	44·0	10·8	48·9	46·6	·320	3·7	0·3	93	540	—	—	—	7	2	10	12	—	5·5	22	5·72
		Nov.	29·710	1·369	58·2	29·9	28·3	50·3	41·9	8·5	45·9	43·0	·278	3·2	0·3	90	544	—	—	—	9	0	6	15	—	5·0	22	5·03
		Dec.	29·570	1·190	52·1	28·0	24·1	48·1	41·6	6·5	44·8	42·0	·267	3·1	0·3	90	543	—	—	—	8	0	10	13	—	5·6	24	5·29
PORTSMOUTH, William C. Ellis, Esq., F.M.S.	16	Oct.	29·711	1·152	64·6	29·2	35·4	57·2	40·4	16·8	49·2	43·8	·287	3·3	0·8	82	541	85·8	32·8	1·5	4	5	10	12	2·4	6·8	22	4·90
		Nov.	29·713	1·496	58·4	27·4	31·0	51·7	38·3	13·4	45·5	40·3	·250	2·8	0·7	83	545	71·7	31·6	2·0	5	3	12	10	2·7	7·6	24	4·78
		Dec.	29·593	1·276	56·2	24·8	31·4	49·4	36·5	12·9	44·0	39·4	·242	2·8	0·5	83	544	65·6	29·9	1·7	4	5	12	10	2·3	7·7	25	4·84
WORTHING (Sussex), W. J. Harris, Esq. M.R.C.S.E., L.S.A.	31	Oct.	29·704	1·164	63·9	34·1	29·8	57·3	45·2	12·1	50·6	47·7	·332	3·7	0·4	90	538	93·2	40·0	1·1	5	4	9	13	3·5	6·3	22	4·84
		Nov.	29·679	1·555	57·7	31·8	25·9	51·2	42·3	8·9	46·3	43·1	·279	3·2	0·4	89	543	64·2	38·7	1·2	7	1	9	13	4·1	7·1	26	5·88
		Dec.	29·568	1·336	52·0	29·4	22·6	48·3	40·7	7·6	44·6	41·6	·262	3·0	0·4	89	543	55·9	35·6	1·1	5	3	12	11	4·6	6·6	20	4·27
BRIGHTON (Sussex), Frederick E. Sawyer, Esq., F.M.S.	200	Oct.	29·504	1·175	64·3	36·0	28·3	55·2	44·9	10·3	49·3	46·0	·311	3·6	0·4	89	537	88·6	39·2	1·1	5	4	10	12	—	6·4	23	4·77
		Nov.	29·488	1·534	57·0	32·0	25·0	49·8	41·9	7·9	45·5	43·2	·279	3·2	0·3	92	541	76·2	36·9	1·7	7	1	10	12	—	7·9	28	6·04
		Dec.	29·409	1·339	52·3	29·8	22·5	46·9	40·0	6·9	43·6	41·2	·259	3·0	0·3	91	541	68·4	34·5	1·4	5	3	12	11	—	7·7	24	5·09
LYMINGTON (Hants), George J. Jones, Esq.	77	Oct.	29·631	1·142	63·6	32·0	31·6	56·8	43·3	13·5	49·5	44·7	·297	3·5	0·6	84	538	—	—	1·0	8	5	7	11	—	5·9	18	5·38
		Nov.	29·645	1·312	58·2	26·4	31·8	51·0	42·1	8·9	46·2	41·9	·267	3·1	0·5	86	548	—	—	1·4	7	1	7	13	—	6·6	20	5·29
		Dec.	29·509	1·479	53·6	26·0	27·6	48·6	41·2	7·4	44·8	41·8	·264	3·0	0·4	88	542	—	—	0·9	5	4	10	12	—	7·1	23	5·11
TAUNTON (Somerset), Rev. W. Tuckwell, F.M.S.	80	Oct.	29·629	1·226	66·0	26·3	39·7	55·5	40·4	15·1	47·8	45·9	·311	3·5	0·2	93	541	65·2	35·7	0·2	9	5	4	15	7·0	6·0	22	4·22
		Nov.	29·605	1·539	60·2	28·7	31·5	51·8	40·6	10·7	46·0	41·1	·269	3·0	0·6	94	542	56·2	30·4	0·2	8	2	10	10	6·5	5·1	19	4·30
		Dec.	29·476	1·143	56·5	24·3	32·2	49·2	38·3	10·9	44·0	42·7	·274	3·1	0·2	96	543	52·1	—	0·8	1	3	6	21	6·6	6·2	21	5·47
WILTON HOUSE (near Salisbury), T. Challis, Esq.	186	Oct.	29·596	1·236	67·5	27·5	40·0	57·8	38·2	19·0	47·1	44·0	·288	3·3	0·4	[illegible]	540	[illegible]	27·0	1·5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Nov.	29·481	1·602	65·5	29·0	34·5	51·3	36·8	14·5	44·3	41·1	·259	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Dec.	29·367	1·120	56·5	23·5	33·0	48·2	36·3	11·9	[illegible]	[illegible]	·224	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Rev. C. H. Griffith, M.A., F.M.S.		Dec.	29·385	1·147	55·2	25·6	29·6	46·9	37·7	9·2	42·6	39·7	·244	2·8	0·3	90	542	66·1	32·6	0·6	4	8	11	8	4·1	7·5	23	4·27
Weybridge Heath (Surrey), William F. Harrison, Esq., F.M.S.	150	Oct.	29·582	1·190	66·8	27·8	39·0	56·1	38·7	17·4	46·7	42·2	·270	3·1	0·4	83	541	80·1	36·1	0·4	4	5	15	7	0·6	6·1	21	4·45
		Nov.	29·544	1·545	61·0	30·3	30·7	50·2	38·9	11·3	44·6	40·4	·252	2·8	0·5	86	543	66·3	37·0	1·2	6	1	16	7	1·5	6·5	20	3·36
		Dec.	29·449	1·112	55·0	24·5	30·5	46·3	37·1	9·2	42·1	39·1	·239	2·7	0·4	89	544	53·5	35·7	1·0	4	5	15	7	1·2	6·1	21	4·03
Marlborough College (Wilts), Rev. Thomas A. Preston, M.A.	456	Oct.	29·225	1·168	62·2	27·0	35·2	54·3	39·7	14·6	46·2	43·7	·285	3·2	0·4	91	535	92·9	25·9	—	5	6	11	9	1·8	6·8	21	5·67
		Nov.	29·224	1·355	60·5	30·2	30·3	49·7	38·5	11·2	43·6	40·3	·250	2·9	0·4	88	538	65·9	35·7	—	4	5	6	15	4·2	7·0	22	5·23
		Dec.	29·106	1·335	54·6	23·4	31·2	45·9	36·7	9·2	41·6	38·7	·236	2·7	0·3	90	538	54·1	33·0	—	6	4	11	10	3·0	8·0	25	5·50
Royal Observatory (Kent), The Astronomer Royal.	159	Oct.	29·533	1·163	66·6	29·1	37·5	56·7	41·1	15·6	47·8	45·0	·299	3·4	0·4	91	539	84·3	34·6	0·3	3	4	12	12	—	6·8	22	4·33
		Nov.	29·511	1·507	61·8	32·3	29·5	50·8	40·8	10·0	45·3	41·7	·254	3·1	0·5	87	541	67·5	34·9	1·1	6	2	11	11	—	7·1	24	2·92
		Dec.	29·413	1·152	55·4	27·1	28·3	47·0	38·7	8·3	42·9	39·7	·244	2·8	0·4	83	542	56·9	32·9	0·7	5	5	11	10	—	7·1	21	4·07
The Guildhall (London), William Haywood, Esq.		Oct.	—	1·016	64·0	38·6	25·4	55·1	46·2	8·9	50·3	45·6	·306	3·5	0·7	84	534	—	—	—	-	-	-	-	—	—	—	4·43
		Nov.	—	1·348	60·0	35·5	24·5	51·5	43·3	8·2	47·3	43·6	·283	3·2	0·5	88	538	—	—	—	-	-	-	-	—	—	—	3·13
		Dec.	—	1·189	52·3	34·0	18·3	47·7	40·5	7·2	44·2	39·4	·242	2·8	0·5	83	540	—	—	—	-	-	-	-	—	—	—	4·10
Streatley Vicarage (Berks), Rev. J. Slatter, M.A., F.R.A.S.	150	Oct.	29·594	1·175	65·6	32·3	33·3	56·6	40·4	16·2	47·7	44·4	·293	3·5	0·4	89	540	63·7	—	1·2	4	6	10	11	—	6·4	14	3·71
		Nov.	29·549	1·582	61·5	29·4	32·1	51·3	39·2	12·1	45·2	42·3	·269	3·1	0·4	80	542	56·5	—	1·9	6	4	9	11	—	6·4	24	3·30
		Dec.	29·478	0·927	55·3	24·3	31·0	47·5	37·5	10·0	42·7	40·0	·246	2·8	0·5	89	544	51·7	—	1·6	5	3	11	12	—	7·2	24	4·76
St. John's College, Battersea, Rev. J. P. Faunthorpe, M.A., F.R.G.S.	13	Oct.	29·697	1·073	68·0	27·0	41·0	55·7	38·0	17·7	47·5	44·7	·296	3·4	0·4	90	542	73·3	31·6	1·5	0	1	19	11	—	6·5	22	5·02
		Nov.	29·683	1·591	60·0	28·5	31·5	50·3	36·8	13·5	44·0	41·1	·259	2·9	0·4	90	546	55·1	31·2	2·1	3	2	15	10	—	4·7	22	3·11
Camden Town (London), G. J. Symons, Esq., F.M.S.	123	Oct.	29·578	1·193	65·3	31·8	33·5	56·0	41·3	14·7	48·2	44·4	·293	3·4	0·5	88	539	72·6	38·5	—	6	6	7	12	—	5·9	20	5·20
		Nov.	29·544	1·537	61·2	31·7	29·5	50·9	40·2	10·7	44·4	42·3	·271	3·1	0·3	91	543	59·0	37·4	—	7	2	8	13	—	6·0	21	3·98
		Dec.	29·446	1·129	54·6	26·6	28·0	47·0	38·2	8·8	43·2	30·5	·242	2·8	0·4	86	543	50·6	35·4	—	6	4	8	13	—	6·6	22	4·35
Chiswick (London), Thiselton Dyer, Esq.	25	Oct.	29·677	1·086	66·0	28·2	37·8	56·1	38·7	17·4	47·1	45·8	·310	3·6	0·1	96	542	78·9	35·0	—	3	5	16	7	—	—	24	4·65
Oxford (Oxfordshire), Rev. R. Main, M.A., F.R.S., F.R.A.S.	210	Oct.	29·465	1·221	65·5	30·4	35·1	54·6	41·2	13·4	47·4	43·2	·279	3·2	0·5	87	537	92·8	37·1	0·8	5	5	12	9	0·6	7·9	25	2·90
		Nov.	29·435	1·671	62·1	30·4	31·7	50·1	40·4	9·7	45·2	39·7	·214	2·8	0·6	81	540	81·4	37·3	1·6	6	1	14	9	1·8	7·9	21	3·13
		Dec.	29·355	0·845	54·9	25·3	29·6	46·2	38·1	8·1	42·3	38·3	·232	2·7	0·5	86	542	68·4	35·7	0·9	5	6	12	8	1·2	8·0	22	3·79
Gloucester (Gloucester), E. Toller, Esq., M.D.	100	Oct.	29·628	1·223	64·8	29·5	35·3	56·1	42·0	14·1	48·1	44·7	·296	3·4	0·4	89	540	77·3	41·4	0·5	7	6	7	11	1·2	5·7	20	3·12
		Nov.	29·608	1·525	67·0	30·5	36·5	51·7	41·0	10·7	46·0	40·6	·254	2·9	0·6	83	542	64·6	39·0	0·8	5	3	9	13	1·2	7·0	22	5·19
		Dec.	29·493	1·011	55·6	24·1	31·5	47·6	38·9	8·7	42·3	39·3	·240	2·7	0·4	89	544	56·3	36·8	0·6	6	5	10	10	1·9	7·1	22	2·75
Royston (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	Oct.	29·448	1·073	65·6	29·4	36·2	56·1	40·8	15·3	47·2	45·3	·303	3·4	0·3	94	538	—	—	—	-	-	-	-	—	6·6	24	3·89
		Nov.	29·393	1·455	60·7	31·4	29·3	50·4	38·2	12·2	44·4	41·4	·260	3·0	0·4	89	540	—	—	—	-	-	-	-	—	6·6	22	2·74
		Dec.	29·293	1·120	52·7	27·3	25·4	46·1	36·4	9·7	41·5	38·6	·234	2·7	0·4	90	541	—	—	—	-	-	-	-	—	7·5	25	3·42
Cardington (near Bedford), Mr. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	109	Oct.	29·608	1·105	67·0	29·4	37·6	55·0	39·4	15·6	47·0	45·1	·301	3·4	0·3	94	541	67·7	33·7	0·7	3	6	11	11	—	7·0	19	3·15
		Nov.	29·590	1·375	61·6	30·4	31·2	50·2	38·4	11·8	44·3	40·4	·252	2·9	0·5	86	544	54·3	32·5	1·3	5	2	13	10	—	5·4	19	3·36
		Dec.	29·476	1·290	52·4	25·0	27·4	46·0	36·1	9·9	41·5	38·8	·237	2·7	0·3	91	545	47·0	31·1	0·9	6	3	15	7	—	6·8	18	3·20
St. David's College, Lampeter (Cardiganshire), Prof. A. W. Scott.	420	Oct.	29·272	1·270	63·5	25·0	38·5	54·8	39·0	15·8	46·0	43·2	·280	3·2	0·3	91	536	63·5	—	—	7	7	9	8	—	—	24	9·47
		Nov.	29·223	1·702	59·0	24·0	35·0	50·0	35·7	14·3	43·0	39·9	·247	2·8	0·3	89	539	68·0	—	—	6	3	13	8	—	—	23	8·03
Leamington (Warwickshire), S. Urwick Jones, Esq., F.M.S.	195	Oct.	29·481	1·109	63·0	28·0	35·0	53·5	41·2	12·3	46·3	43·6	·283	3·2	0·4	91	539	—	—	0·7	3	9	7	12	—	7·6	21	3·31
		Nov.	29·440	1·267	60·0	32·5	27·5	49·5	39·7	9·8	44·9	40·2	·249	2·9	0·6	83	540	—	—	0·9	5	4	5	16	—	6·5	22	4·48
		Dec.	29·337	1·040	52·3	26·0	26·3	45·5	37·5	8·0	41·6	38·7	·235	2·7	0·3	91	542	—	—	0·7	3	6	10	12	—	7·7	21	3·36
Somerleyton Rectory (Suffolk), Rev. C. J. Steward, F.M.S.	50	Oct.	29·649	0·996	66·0	31·1	34·9	56·7	41·8	14·9	48·7	47·2	·326	3·7	0·2	95	540	—	33·0	0·9	2	5	15	9	6·3	6·4	23	3·13
		Nov.	29·621	1·218	61·4	31·8	29·6	50·0	39·0	11·0	44·4	41·1	·259	2·9	0·4	89	544	—	30·6	1·1	4	4	12	10	7·0	6·0	23	4·87
		Dec.	29·525	1·188	53·2	27·5	25·7	46·1	37·0	9·1	41·8	40·8	·255	2·9	0·1	95	546	—	27·9	1·6	4	6	12	9	6·6	6·1	23	3·47

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1872. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean. Of all Highest.	Mean. Of all Lowest.	Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Sat^{n}. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
NORWICH (Norfolk), C. M. Gibson, Esq., F.M.S.	42	Oct.	29·650	1·026	65·0	31·8	33·2	54·1	40·6	13·5	47·2	45·1	·300	3·5	0·3	93	542	—	—	—	3	5	14	9	—	—	20	3·30
		Nov.	29·625	1·398	60·0	31·0	29·0	48·8	38·0	10·8	43·3	40·4	·252	2·9	0·4	90	546	—	—	—	4	3	14	9	—	—	18	3·78
		Dec.	29·536	1·149	51·5	27·5	24·0	45·2	36·0	9·2	41·1	38·8	·236	2·7	0·3	92	546	—	—	—	4	8	12	7	—	—	17	3·82
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	Oct.	29·672	1·011	64·4	32·0	32·4	54·8	41·5	13·3	47·5	45·3	·304	3·5	0·3	93	542	83·4	38·1	0·4	5	7	10	9	1·6	6·9	22	3·35
		Nov.	29·633	1·292	61·2	31·0	30·2	49·7	39·4	10·3	44·1	41·0	·260	3·9	0·4	89	545	73·2	36·0	0·7	4	5	14	7	3·6	6·5	19	3·50
		Dec.	29·543	1·153	51·2	29·0	22·2	45·0	37·2	7·8	41·0	39·3	·241	2·7	0·3	94	547	59·8	34·8	0·4	5	9	11	6	2·2	7·2	19	3·27
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	Oct.	29·538	1·290	62·5	35·1	27·4	54·7	43·7	11·0	48·7	43·1	·279	3·2	0·7	81	538	—	—	0·9	7	4	7	13	—	6·0	23	8·17
		Nov.	29·498	1·645	64·0	33·0	31·0	50·4	41·0	9·4	46·1	40·6	·256	3·0	0·4	82	540	—	—	1·3	9	0	4	17	—	6·8	23	5·22
		Dec.	29·390	1·512	56·0	30·5	25·5	47·3	38·3	9·0	43·4	38·7	·234	2·7	0·5	83	541	—	—	0·7	4	6	7	14	—	6·8	20	4·23
DERBY (Derbyshire), John Davis, Esq.	174	Oct.	29·475	1·158	61·0	30·0	31·0	53·0	41·2	11·8	46·4	45·0	·300	3·5	0·1	95	539	—	—	—	5	7	8	11	—	—	21	4·56
		Nov.	29·430	1·340	61·0	30·0	31·0	49·6	39·2	10·4	44·1	39·0	·238	2·8	0·6	82	541	—	—	—	7	1	14	8	—	—	24	2·36
		Dec.	29·352	1·046	52·0	26·0	26·0	45·0	36·6	8·4	41·0	38·7	·235	2·7	0·3	92	542	—	—	—	5	7	12	7	—	—	22	3·78
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	241	Oct.	29·404	1·107	63·7	27·3	36·4	55·0	39·9	15·1	46·5	42·9	·277	3·2	0·5	88	538	80·3	32·4	0·4	4	5	11	11	0·7	6·6	21	3·69
		Nov.	29·370	1·171	62·4	28·3	34·1	50·1	37·9	12·2	43·7	40·8	·256	3·0	0·2	90	541	56·7	29·8	0·6	5	4	10	11	1·7	5·6	24	3·13
		Dec.	29·262	1·121	51·7	24·4	27·3	44·4	35·5	8·9	40·2	37·9	·228	2·6	0·3	92	542	41·9	28·1	0·5	5	8	11	7	0·9	7·7	25	3·47
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	30	Oct.	29·646	1·049	65·0	28·2	36·8	54·7	40·6	14·1	47·5	43·5	·283	3·3	0·5	87	541	90·0	34·3	1·0	5	4	16	6	—	6·8	18	2·51
		Nov.	29·613	1·187	61·0	27·0	34·0	50·2	38·2	12·0	44·3	39·5	·243	2·9	0·5	83	544	66·4	31·1	1·6	5	2	20	8	—	6·5	16	3·56
HAWARDEN (Flint), T. Moffat, Esq., M.D., F.R.A.S.	270	Oct.	29·364	1·412	61·0	34·0	27·0	52·3	43·0	9·3	46·4	44·3	·301	3·3	0·3	93	537	83·7	21·7	1·7	9	5	11	6	0·5	5·9	27	7·02
		Nov.	29·318	1·438	63·0	32·0	31·0	47·6	39·7	7·9	43·5	40·2	·250	2·9	0·4	88	540	72·2	19·2	2·4	5	3	12	10	1·5	6·5	22	4·01
		Dec.	29·208	1·069	52·0	30·0	22·0	44·1	37·5	6·6	40·7	38·7	·235	2·5	0·3	92	541	51·2	19·0	1·9	5	3	15	8	2·0	7·0	23	3·90
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	Oct.	29·470	1·166	61·2	32·1	29·1	53·5	42·9	10·6	47·4	43·4	·282	3·2	0·4	86	538	—	—	1·1	6	8	8	9	—	6·2	25	6·63
		Nov.	29·444	1·484	63·0	32·0	31·0	49·3	40·1	9·2	44·2	39·8	·246	2·9	0·5	85	541	—	—	1·5	6	6	10	8	—	5·9	21	2·80
		Dec.	29·328	1·058	53·0	28·3	24·7	44·9	37·3	7·6	41·3	37·9	·229	2·7	0·4	88	543	—	—	1·3	5	9	9	8	—	7·4	23	3·61
ECCLES (near Manchester), T. Mackereth, Esq., F.R.A.S., F.M.S.	145	Oct.	29·497	1·234	62·5	26·5	36·0	53·8	39·0	14·8	46·1	41·6	·264	3·1	0·5	85	540	60·1	32·1	0·2	6	5	10	10	1·5	6·1	22	4·40
		Nov.	29·454	1·526	61·5	30·0	31·5	49·6	37·9	11·7	43·9	39·0	·238	2·7	0·5	83	542	55·4	30·3	1·0	4	6	11	9	2·8	5·9	26	3·43
		Dec.	29·371	1·550	51·8	23·8	28·0	44·0	35·6	8·4	40·8	36·8	·218	2·6	0·5	86	544	46·5	29·6	0·7	7	10	9	5	1·9	8·0	25	3·05
MOOR SIDE OBSERVATORY, HALIFAX, (Yorkshire), Louis J. Crossley, Esq., F.M.S.	429	Oct.	29·106	1·138	63·0	27·5	35·5	52·1	38·7	13·4	44·6	42·6	·269	3·1	0·2	94	535	84·2	35·1	1·3	6	7	7	11	1·0	7·9	23	4·50
		Nov.	29·065	1·444	60·0	27·5	32·5	47·7	35·9	11·8	42·0	39·3	·241	2·8	0·3	91	537	68·6	32·0	1·4	6	6	8	10	2·2	6·1	26	5·77
		Dec.	28·967	1·153	53·0	22·0	31·0	43·5	34·5	9·0	38·9	37·2	·223	2·7	0·2	94	538	50·2	30·6	—	7	8	10	6	2·6	7·5	22	2·33
PARK ROAD OBSERVATORY (Halifax, Yorkshire), Edward Crossley, Esq., F.R.A.S.	618	Nov.	28·924	1·381	59·0	30·0	29·0	46·6	37·4	9·2	41·6	38·0	·220	2·6	0·4	88	535	63·5	—	0·6	5	5	6	14	—	7·9	23	6·33
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	Oct.	29·652	1·133	64·0	27·0	37·0	52·9	40·4	12·5	46·5	43·3	·281	3·2	0·5	89	542	70·0	39·1	—	-	-	-	-	—	—	20	3·39
		Nov.	29·597	1·250	60·0	27·0	33·0	47·4	37·6	9·8	43·1	38·0	·220	2·7	0·5	89	546	60·9	35·6	—	-	-	-	-	—	—	22	4·29
		Dec.	29·510	1·318	50·0	23·0	27·0	43·1	35·9	7·2	40·0	36·5	·208	2·5	0·3	89	547	49·5	34·0	—	-	-	-	-	—	—	21	3·82
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	381	Oct.	29·218	1·312	60·7	30·6	30·1	53·0	41·2	11·8	46·1	42·5	·273	3·2	0·4	88	535	95·5	36·1	—	4	6	8	13	—	7·5	30	6·00
		Nov.	29·203	1·532	61·9	26·9	35·0	49·1	39·2	9·9	44·0	40·3	·250	2·9	0·4	87	537	81·6	33·7	—	6	4	10	10	—	7·7	29	4·70
		Dec.	29·112	1·430	51·2	24·5	26·7	44·4	36·9	7·5	40·9	37·1	·220	2·6	0·4	86	539	61·8	32·3	—	6	8	11	6	—	8·4	30	4·09
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	363	Oct.	29·198	1·169	60·5	35·0	25·5	53·7	43·2	10·5	47·0	42·1	·269	3·1	0·7	83	533	63·2	—	1·0	—	—	—	—	—	6·5	19	4·27
		Nov.	29·211	1·337	61·5	31·6	29·9	50·1	40·5	9·6	44·6	39·0	·238	2·7	0·6	80	535	55·2	—	1·6	—	—	—	—	—	5·5	20	4·42
		Dec.	29·115	1·116	54·0	25·6	28·4	45·5	36·8	8·8	41·0	37·0	·221	2·5	0·5	88	539	49·2	—	1·1	—	—	—	—	—	6·0	17	3·62

YORK (Yorkshire), J. F. FRYER, Esq.	50	Nov.	29·526	1·361	61·0	26·0	35·0	46·9	37·7	9·2	42·3	40·0	·249	2·9	0·2	92	545	–	–	–	3	8	14	5	–	–	28	4·28
		Dec.	29·460	1·254	50·0	26·0	24·0	42·7	35·6	7·1	39·9	37·8	·227	2·7	0·2	93	546	–	–	–	2	11	15	3	–	–	19	3·69
COCKERMOUTH (Cumberland), H. DODGSON, Esq., M.D., F.R.A.S., F.M.S.	145	Oct.	29·452	1·331	60·8	31·4	29·4	54·5	41·9	12·6	47·2	42·6	·273	3·1	0·6	85	538	80·8	38·9	0·6	6	7	12	6	2·5	5·7	17	7·77
		Nov.	29·389	1·742	57·3	25·6	31·7	48·5	39·2	9·3	43·5	38·9	·237	2·8	0·4	83	541	59·6	30·1	0·8	3	8	14	5	3·4	5·2	17	5·20
		Dec.	29·309	1·380	54·8	21·2	33·6	45·2	37·1	8·1	40·9	36·6	·216	2·5	0·4	85	543	48·4	29·1	0·8	4	9	13	5	3·3	6·5	16	5·03
ALLENHEADS (Northumberland), MR. S. STOBBS, Assistant to W. B. BEAUMONT, Esq., M.P.	1360	Oct.	28·128	1·123	55·4	28·1	27·3	48·8	37·4	11·4	42·0	40·7	·253	2·9	0·2	95	519	74·6	35·4	0·2	–	–	–	–	–	6·8	24	8·08
		Nov.	28·104	1·424	55·0	27·5	27·5	43·9	34·5	9·4	38·7	37·1	·221	2·6	0·1	94	523	65·0	32·2	2·3	–	–	–	–	–	6·3	28	7·39
		Dec.	28·035	1·080	48·0	13·5	34·5	39·5	30·6	8·9	35·0	33·4	·192	2·2	0·2	94	525	58·8	28·6	1·6	–	–	–	–	–	7·5	24	5·96
SILLOTH RECTORY (Cumberland), REV. FRANCIS REDFORD, M.A., F.R.A.S., F.M.S.	28	Oct.	29·588	1·290	62·3	30·5	31·8	55·8	41·2	14·6	47·6	42·7	·274	3·2	0·6	88	540	86·0	37·4	1·3	6	9	7	9	7·5	6·6	18	6·03
		Nov.	29·517	1·789	57·5	23·2	34·3	54·4	38·1	16·3	46·8	42·8	·275	3·1	0·5	86	540	69·6	32·9	1·6	6	8	8	8	9·0	6·7	16	3·30
		Dec.	29·436	1·353	54·5	22·8	31·7	44·6	36·1	8·5	40·0	36·6	·217	2·6	0·4	88	541	57·3	31·0	1·5	5	13	7	6	8·8	7·2	17	3·21
CARLISLE (Cumberland), J. CARTMELL, Esq., F.M.S.	114	Oct.	29·486	1·274	62·5	25·2	37·3	54·2	39·4	14·8	46·0	44·3	·292	3·4	0·4	94	540	72·2	32·2	1·5	4	9	6	12	4·8	6·8	19	4·16
		Nov.	29·432	1·629	63·2	22·5	40·7	48·8	36·6	12·2	42·2	38·6	·235	2·7	0·3	87	543	59·5	31·3	1·7	6	4	11	9	5·9	6·0	22	2·43
		Dec.	29·344	1·182	58·3	20·2	38·1	44·2	34·3	9·9	39·3	36·4	·215	2·5	0·3	90	545	47·4	29·2	1·4	3	9	12	7	4·7	7·7	16	2·60
BYWELL (Northumberland), MR. JOHN DAWSON, Assistant to W. B. BEAUMONT, Esq., M.P.	87	Oct.	29·500	1·155	61·0	34·0	27·0	52·8	41·7	11·1	46·2	39·8	·246	2·9	0·7	79	540	63·4	34·8	1·2	4	3	6	18	–	5·8	24	5·83
		Nov.	29·435	1·517	61·0	32·0	29·0	47·9	39·3	8·6	43·0	36·2	·213	2·5	0·7	77	543	53·6	32·6	1·3	6	5	4	15	–	5·9	27	5·13
		Dec.	29·384	1·217	56·0	25·0	31·0	44·8	37·0	7·8	40·8	34·6	·201	2·3	0·5	80	543	48·1	30·2	1·2	2	12	7	10	–	7·3	26	5·50
NORTH SHIELDS (Northumberland), ROBERT SPENCE, Esq.	124	Oct.	29·540	1·189	59·8	32·2	27·6	51·5	41·6	9·9	45·7	42·0	·267	3·0	0·5	87	541	–	39·5	1·7	7	4	8	12	–	5·7	22	5·96
		Nov.	29·500	1·489	67·0	32·0	35·0	50·2	39·2	11·0	45·6	39·2	·241	2·7	0·5	85	543	–	38·2	1·8	9	4	6	11	–	7·2	23	4·11
		Dec.	29·440	1·487	50·2	26·2	24·0	44·7	37·1	7·6	40·8	35·6	·209	2·4	0·5	82	545	–	35·5	1·9	7	5	8	11	–	8·3	26	4·46
MILTOWN (Banbridge, Ireland), JOHN SMYTH, Esq., jun., M.A., M.I.C.E.I.	200	Oct.	29·406	1·393	63·0	30·0	33·0	52·1	39·6	12·5	45·1	41·3	·260	3·0	0·5	87	540	80·4	35·5	2·0	8	3	12	8	3·8	4·3	18	4·52
		Nov.	29·332	1·873	63·0	28·0	35·0	47·4	37·2	10·2	42·3	38·1	·230	2·6	0·5	85	541	63·9	32·2	2·3	6	3	14	7	4·7	4·8	21	4·20
		Dec.	29·216	1·313	53·0	25·0	28·0	44·0	34·9	9·1	39·7	36·3	·214	2·5	0·4	88	542	51·9	30·3	1·7	7	7	12	5	3·5	5·5	21	5·56

NOTE.—*The Barometer Reading*, TAUNTON, November 7th, 3h. p.m., 29·354 in., has been altered to 30·354 in.
" " " 8th, 3h. p.m., 29·284 in., " 30·284 in.
" " December 25th, 3h. p.m., 28·000 in., " 29·000 in.
" LEEDS, November 23rd, 4h. p.m., 29·800 in., " 28·800 in.
" GLOUCESTER, " 30th, 4h. p.m., 29·758 in., " 28·758 in.
" BRADFORD, " 29th, 3h. p.m., 29·992 in., " 28·992 in.

Second Rain-gauges are placed—

			October.		November.		December.		Total during the Quarter.
At Eastbourne,	at the height of 160 feet *above the sea*,	the amount collected was	5·82 inches.	-	6·77 inches.	-	7·04 inches.	-	19·63 inches.
" Beachy Head,	" 610 feet "	"	4·30 "	-	5·25 "	-	4·90 "	-	14·45 "
" Portsmouth,	" 20 feet *above the ground*	"	4·61 "	-	4·50 "	-	4·53 "	-	13·64 "
" Strathfield Turgiss,	" 38 feet "	"	2·55 "	-	2·36 "	-	2·96 "	-	7·87 "
" Eccles, Manchester,	" 34 feet "	"	3·64 "	-	2·46 "	-	2·71 "	-	8·81 "
" Allenheads,	" 6½ feet "	"	8·84 "	-	8·58 "	-	7·86 "	-	25·28 "
" Carlisle,	" 3 feet "	"	1·64 "	-	1·15 "	-	0·94 "	-	3·73 "
" Miltown, Ireland,	" 40 feet "	"	4·37 "	-	3·56 "	-	4·52 "	-	12·45 "
" Brighton,	" 35 feet "	"	3·63 "	-	4·71 "	-	3·78 "	-	12·12 "
" Radcliffe Observatory,	" 22 feet "	"	2·78 "	-	2·93 "	-	3·28 "	-	8·99 "
" Marlborough College,	" 8 inches "	"	5·52 "	-	4·97 "	-	5·25 "	-	15·74 "
" "	" 1 foot "	"	5·53 "	-	4·91 "	-	5·01 "	-	15·45 "
" Cardington,	" 36 feet "	"	2·80 "	-	2·60 "	-	2·75 "	-	8·15 "
" Nottingham,	" 25½ feet "	"	3·60 "	-	2·90 "	-	3·38 "	-	9·88 "
" Wisbech,	" 8 feet "	"	3·28 "	-	3·30 "	-	3·13 "	-	9·71 "
" Aldershot Camp,	" 25 feet "	"	3·95 "	-	2·54 "	-	3·73 "	-	10·22 "
" Cockermouth,	" 6½ feet "	"	7·50 "	-	4·96 "	-	4·86 "	-	17·31 "

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	WIND. Mean Estimated Strength.	WIND. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°							
Guernsey	29·379	63·5	34·5	29·0	52·8	45·5	21·3	7·3	49·0	44·9	·300	3·4	0·5	86	536	—	—	1·8	4	4	12	10	4·5	6
Helston	29·449	66·0	34·0	32·0	55·5	45·2	26·7	10·3	50·2	42·5	·272	3·2	1·0	76	535	63·2	41·5	2·2	7	2	9	13	5·7	6
Truro	29·367	62·0	27·0	35·0	53·0	42·7	28·3	10·3	47·5	43·9	·288	3·2	0·5	88	541	—	—	2·8	8	2	8	12	—	6
Eastbourne	29·413	64·3	30·0	34·3	52·5	43·0	27·9	9·5	47·8	43·5	·280	3·2	0·6	85	542	66·2	36·8	0·7	4	4	9	14	4·3	—
Osborne	29·394	64·2	26·2	38·0	52·2	40·4	29·6	11·8	46·1	43·7	·287	3·2	0·4	92	540	62·3	39·4	0·1	4	3	14	9	—	6
Bournemouth	29·512	61·2	28·0	33·2	51·1	42·5	27·3	8·6	46·5	43·9	·288	3·3	0·3	91	542	—	—	—	8	1	9	13	—	5
Portsmouth	29·434	64·6	24·8	39·8	52·8	38·4	32·6	14·4	46·2	41·2	·260	3·0	0·7	83	543	74·4	31·4	1·7	4	4	11	11	2·5	7
Worthing	29·392	63·9	29·4	34·5	52·3	42·7	26·1	9·6	47·2	44·1	·291	3·3	0·4	89	541	71·2	38·1	1·1	6	3	10	12	4·1	6
Brighton	29·402	64·3	29·8	34·5	50·6	42·3	25·3	8·3	46·1	43·5	·283	3·3	0·3	91	540	77·7	36·9	1·4	6	3	11	12	—	7
Taunton	29·372	66·0	24·3	41·7	52·0	39·8	34·5	12·2	45·9	43·2	·285	3·2	0·3	91	542	57·8	—	0·2	6	3	7	15	6·7	5
Wilton House	29·391	67·5	23·5	44·0	52·2	37·1	35·8	15·1	44·7	41·9	·267	3·0	0·4	90	541	75·7	36·0	1·7	6	4	13	8	5·1	6
Barnstaple	29·346	65·0	27·0	38·0	52·6	42·5	29·8	10·1	47·4	43·8	·286	3·2	0·4	88	540	—	—	1·1	5	4	11	11	—	4
Aldershot Camp	29·369	65·2	26·4	38·8	51·2	39·2	31·0	12·0	44·7	42·1	·269	3·1	0·4	90	538	69·2	35·8	1·5	4	4	12	11	2·1	7
Strathfield Turgiss	29·418	67·3	24·7	42·6	51·2	38·7	34·2	12·5	45·0	41·7	·264	2·7	0·4	89	541	78·2	33·1	0·6	5	7	10	9	4·0	6
Weybridge Heath	29·436	66·8	24·5	42·3	50·8	38·2	33·4	12·6	44·5	40·6	·254	2·9	0·4	86	543	66·6	36·3	0·9	5	4	15	7	1·1	6
Marlborough College	29·422	62·2	23·4	38·8	50·0	38·3	32·2	11·7	43·8	40·9	·257	2·9	0·4	90	537	71·0	31·5	—	5	5	9	11	3·0	7
Royal Observatory	29·391	66·6	27·1	39·5	51·5	40·2	31·8	11·3	45·3	42·1	·269	3·1	0·4	89	541	69·6	34·1	0·7	5	4	11	11	—	7
The Guildhall	—	64·0	34·0	30·0	51·4	43·3	22·7	8·1	47·3	42·9	·277	3·2	0·6	85	537	—	—	—	—	—	—	—	—	—
Streatley Vicarage	29·440	65·6	24·3	41·3	51·8	39·0	32·1	12·8	45·2	42·2	·269	3·1	0·4	89	542	57·3	—	1·6	5	4	10	11	—	6
Camden Town	29·388	65·3	26·6	38·7	51·3	39·9	30·3	11·4	45·3	42·1	·269	3·1	0·4	88	542	60·7	37·1	—	6	4	8	13	—	6
Oxford	29·394	65·5	25·3	40·2	50·3	39·9	32·1	10·4	45·0	40·4	·252	2·9	0·5	85	540	80·9	36·7	1·1	5	4	13	9	1·2	7
Gloucester	29·423	67·0	24·1	42·9	51·8	40·6	34·4	11·2	45·5	41·5	·263	3·0	0·5	87	542	66·1	39·1	0·6	6	5	9	11	1·4	6
Royston	29·219	65·6	27·3	38·3	50·9	38·5	30·3	12·4	44·4	41·8	·266	3·0	0·4	91	540	—	—	—	—	—	—	—	—	6
Cardington	29·403	67·0	25·0	42·0	50·4	38·0	32·1	12·4	44·3	41·4	·263	3·0	0·4	90	543	56·3	32·4	1·0	5	4	13	9	—	6
Leamington	29·374	63·0	26·0	37·0	49·5	39·5	29·6	10·0	44·3	40·8	·259	2·9	0·4	88	540	—	—	0·8	4	6	7	13	—	7
Somerleyton Rectory	29·374	66·0	27·5	38·5	50·9	39·3	30·1	11·6	45·0	43·0	·280	3·2	0·2	93	543	—	30·5	1·0	3	5	13	9	6·6	6
Norwich	29·386	65·0	27·5	37·5	49·4	38·2	38·7	11·2	43·9	41·4	·263	3·0	0·3	92	545	—	—	—	4	5	13	8	—	—
Wisbech	29·363	64·4	29·0	35·4	49·8	39·4	28·3	10·4	44·2	41·8	·268	3·0	0·3	92	545	72·1	36·3	0·5	5	7	12	7	2·5	6
Llandudno	29·329	64·0	30·5	33·5	50·8	41·0	28·0	9·8	46·1	40·8	·256	3·0	0·5	82	539	—	—	1·0	7	3	6	15	—	6
Derby	29·351	61·0	26·0	35·0	49·2	39·0	29·3	10·2	43·8	40·9	·258	3·0	0·3	90	541	—	—	—	6	5	11	9	—	—
Nottingham	29·352	63·7	24·4	39·3	49·8	37·8	32·6	12·0	43·5	40·5	·254	2·9	0·3	90	540	59·6	30·1	0·5	5	6	11	9	1·1	6
Hawarden	29·328	63·0	30·0	33·0	48·0	40·1	26·7	7·9	43·5	41·1	·262	2·9	0·3	91	539	69·0	20·0	3·0	6	4	13	8	1·3	6
Liverpool	29·377	63·0	28·3	34·7	49·2	40·1	28·3	9·1	44·3	40·4	·252	2·9	0·4	86	541	—	—	1·3	6	8	9	8	—	6
Eccles	29·358	62·5	23·8	38·7	49·1	37·5	31·8	11·6	43·6	39·1	·240	2·8	0·5	85	542	53·3	30·7	0·6	6	7	10	8	2·1	6
Moorside Observatory	29·264	63·0	22·0	41·0	47·8	36·4	33·0	11·4	41·8	39·7	·244	2·9	0·2	93	537	67·7	32·6	—	6	7	8	9	1·9	7
Hull	29·458	64·0	23·0	41·0	47·8	38·0	32·3	9·8	43·2	39·3	·239	2·8	0·4	87	545	60·1	36·2	—	—	—	—	—	—	—
Stonyhurst	29·343	61·9	24·5	37·4	48·8	39·1	30·6	9·7	43·7	40·0	·248	2·9	0·4	87	537	79·6	34·0	—	5	6	10	10	—	7
Bradford	29·331	61·5	28·6	32·9	49·8	40·2	26·9	9·6	44·5	39·4	·242	2·8	0·6	82	537	55·1	—	1·2	—	—	—	—	—	6
Leeds	29·361	64·0	27·0	37·0	49·2	38·4	32·0	10·8	44·0	39·7	·245	2·8	0·5	85	542	56·3	—	1·2	8	4	7	12	—	6
Cockermouth	29·302	60·8	21·2	39·6	49·4	39·4	31·6	10·0	43·9	39·4	·242	2·8	0·5	84	541	62·9	31·0	0·7	4	8	13	5	3·1	5
Allenheads	29·363	55·4	13·5	41·9	44·1	34·2	29·8	9·9	38·6	37·1	·233	2·6	0·2	94	522	66·1	32·1	1·3	—	—	—	—	—	6
Silloth	29·290	62·3	22·8	39·5	51·6	38·5	32·6	13·1	44·8	40·7	·255	3·0	0·5	87	540	71·0	33·8	1·5	6	10	7	8	8·4	6
Carlisle	29·299	63·2	20·2	43·0	49·1	36·8	38·7	12·3	42·5	39·8	·247	2·9	0·3	90	543	59·7	30·9	1·5	4	7	10	9	5·1	6
Bywell	29·315	61·0	25·0	36·0	48·5	39·3	29·0	9·2	43·3	36·9	·220	2·6	0·6	79	542	55·0	32·5	1·2	4	7	6	14	—	6
North Shields	29·390	67·0	26·2	40·8	48·8	39·3	28·9	9·5	43·4	38·9	·239	2·7	0·5	85	543	—	37·7	1·8	8	4	7	11	—	7
Miltown (Ireland)	29·301	63·0	25·0	38·0	47·8	37·2	32·0	10·6	42·4	38·6	·235	2·7	0·5	87	541	65·1	32·7	2·0	7	4	13	7	4·0	4

The highest temperatures of the air were at Wilton House, 67°·5; Strathfield Turgiss, 67°·3; Gloucester, Cardington, and No 67°·0 respectively; Weybridge Heath, 66°·8; and at the Royal Observatory, 66°·6.

The lowest temperatures of the air were at Allenheads, 13°·5; Carlisle, 20°·2; Cockermouth, 21°·2; Moorside Observatory, 22° 23°·8; Hull, 23°·0; Marlborough College, 23°·4; and at Wilton House, 23°·5.

The greatest daily ranges of the temperatures of the air were at Wilton House, 15°·1; Silloth, 13°·1; Streatley Vicar Weybridge Heath, 12°·6; Strathfield Turgiss, 12°·5; Royston and Cardington, 12°·4 respectively; Carlisle, 12°·3; Taunton, at Aldershot Camp, 12°·0.

The least daily ranges of the temperatures of the air were at Guernsey, 7°·3; Hawarden, 7°·9; Guildhall, 8°·1; Bournem Liverpool, 9°·1; Bywell, 9°·2; North Shields, 9°·5; and at Worthing and Bradford 9°·6 respectively.

The greatest numbers of rainy days were at Stonyhurst, 89; Guernsey, 80; Barnstaple and Leeds, 78 respectively; Truro 77 respectively; Allenheads, 76; Hawarden, 72; Royston, Moorside Observatory, and North Shields, 71 respectively; and at H Nottingham, 70 respectively.

The least numbers of rainy days were at Cockermouth, 50; Silloth, 51; Norwich, 55; Cardington, 56; Carlisle, 57; Wisbech an 60, respectively; Taunton and Weybridge Heath 62, respectively; and at Camden Town and Hull, 63 respectively.

The heaviest falls of rain were at Guernsey, 25·24 inches; Allenheads, 21·43 inches; Barnstaple, 19·36 inches; Eastbo inches; Cockermouth, 18·00 inches; Helston, 17·85 inches; Truro, 17·76 inches; Llandudno, 17·62 inches; Wilton House, 17 and at Bywell, 16·46 inches.

The least falls of rain were at Carlisle, 9·19 inches; Royston, 9·55 inches; Cardington, 9·71 inches; Oxford, 9·82 inches; 10·12 inches; Nottingham, 10·29 inches; Derby, 10·70 inches; Eccles, 10·88 inches; and at Norwich, 10·90 inches.

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	WIND. Mean Estimated Strength.	WIND. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°							
Guernsey	29·379	63·5	34·5	29·0	52·8	45·5	21·3	7·3	49·0	44·9	·300	3·4	0·5	86	536	—	—	1·8	4	4	12	10	4·5	6
Between the latitudes 50° and 51°	29·420	63·8	28·6	35·2	52·5	42·2	28·0	10·3	47·2	43·3	·281	3·2	0·5	87	540	69·7	37·9	1·4	6	3	10	12	4·1	6
Between the latitudes 51° and 52°	29·397	65·6	25·9	39·7	51·4	39·7	31·7	11·7	45·3	42·0	·268	3·0	0·4	88	540	68·7	35·1	1·0	5	4	11	11	3·3	6
Between the latitudes 52° and 53°	29·357	64·7	26·7	37·9	50·3	39·1	31·3	11·1	44·5	41·4	·263	3·0	0·4	90	542	68·5	33·7	0·8	5	5	11	10	2·9	6
Between the latitudes 53° and 54°	29·352	62·9	25·9	37·0	48·7	38·7	30·2	10·0	43·6	39·8	·247	2·8	0·4	87	540	63·0	30·7	1·5	6	6	9	9	1·8	7
Between the latitudes 54° and 55°	29·314	60·5	20·5	40·0	48·5	37·6	32·3	10·9	42·6	38·8	·239	2·8	0·4	87	537	62·9	32·1	1·2	4	8	9	9	5·5	6
North Shields	29·390	67·0	26·2	40·8	48·8	39·3	28·9	9·5	43·4	38·9	·239	2·7	0·5	85	543	—	37·7	1·8	8	4	7	11	—	7
Miltown, Banbridge (Ireland)	29·301	63·0	25·0	38·0	47·8	37·2	32·0	10·6	42·4	38·6	·235	2·7	0·5	87	541	65·1	32·7	2·0	7	4	13	7	4·0	4
Mean for the Quarter 50° to 55°, Year 1869	29·665	72·8	16·5	56·3	49·6	37·8	38·0	11·8	43·4	39·2	·243	2·8	0·5	86	547	66·2	32·7	1·3	8	4	6	13	—	6
" 1870	29·571	67·8	11·1	56·7	47·7	35·4	36·4	12·3	41·3	37·4	·227	2·7	0·5	86	547	62·6	24·6	0·9	7	7	6	11	—	6
" 1871	29·762	65·8	19·1	45·9	48·5	36·7	31·6	11·8	42·3	38·4	·238	2·7	0·5	87	550	38·1	31·2	0·9	6	6	8	10	3·1	6
" 1872	29·368	63·5	25·6	37·8	50·3	39·6	30·6	10·7	44·7	41·1	·260	3·0	0·4	88	540	64·7	34·1	1·2	5	5	10	10	3·6	6

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING MARCH 31, 1873.

Remarks on the Weather during the Quarter ending March 31st, 1873.

By James Glaisher, Esq., F.R.S., *&c.*

The warm period which set in on 9th December 1872, continued without interruption till 19th January, the excess of temperature above their averages on some of these days exceeding 13°, and for the period 1st to 19th January, the mean excess of daily temperature being 10°. Then followed a few days with temperatures differing but little from their averages. On 25th January a cold period began, and continued throughout February, the average defect of daily temperature for the period between 25th January and 1st March being 4°; this was succeeded by a week's warm weather, the excess of daily temperature from 2nd to 9th March being 3½° nearly; a fortnight of cold weather followed, the average defect of temperature being 3¼° daily, and the quarter closed with a week's warm weather; the average daily excess from 24th March amounting to 3¼°.

The prevailing wind during the warm periods was a compound of the S. and W., and during the cold period a compound of the E. and N.

The mean temperature of the month of February at Greenwich was 7¾° below that in January, and that of March was 7½° above that of February; the temperature of January and March were, therefore, nearly equal; the former month being slightly the warmer.

The mean decrease of temperature from January to February from all stations was 6°·1; and the mean increase from February to March was 6°·1.

The mean temperature of January was 4° above the average of the 32 preceding Januaries, and 5¾° above the average of 102 years, whilst that of February was 5° below the average of the 32 preceding Februaries, and 4½° below that of 102 years. The mean temperature of March differed but little from its average value.

Back to 1771 the following are the instances of so high mean temperature of January, viz.,

1796 it was 45°·3	1846 it was 43°·7	1853 it was 42°·4
1804 „ 43°·2	1851 „ 42°·9	1866 „ 42°·6
1834 „ 44°·4	1852 „ 42°·0	1873 „ 42°·1

Therefore back to 1771 there have been only seven Januaries with higher mean temperature than in that of the present year.

The following are instances of low mean temperature in February:—

1771 it was 33°·4	1795 it was 34°·1	1838 it was 32°·9
1772 „ 34°·2	1800 „ 34°·1	1845 „ 32°·7
1782 „ 34°·4	1814 „ 34°·0	1853 „ 33°·3
1784 „ 31°·9	1827 „ 31°·6	1855 „ 29°·4
1785 „ 30°·4	1830 „ 34°·2	1873 „ 34°·3

So that we have to travel back 18 years for so cold a February; and in 102 years there have been only 14 instances of like Februaries.

The corresponding three months most similar to those of this year were in 1853, where the mean temperatures were 42°·4, 33°·3, and 38°·5 respectively, showing a decrease of 9°·1 for February and an increase of 5°·2 for March.

A decline of several degrees in temperature from January to February is rare; the instances on record are as follows:—

1782 the decline was 4°·5	1804 the decline was 6°·3	1855 the decline was 5°·5
1785 „ 5°·7	1845 „ 5°·5	1860 „ 4°·0
1796 „ 5°·7	1853 „ 9°·1	1873 „ 7°·8

The decline of temperature from January to February this year is the greatest of any, (excepting only that in 1853) that has occurred in the period exceeding 100 years.

An increase of several degrees in the mean temperature of March over that in the preceding February is not rare; the instances are as follows:—

1772 the increase was 4°·3	1821 the increase was 6°·8	1843 the increase was 6°·9
1773 „ 6°·0	1827 „ 11°·5	1844 „ 6°·3
1774 „ 4°·8	1830 „ 11°·6	1853 „ 5°·2
1777 „ 8°·8	1836 „ 6°·8	1855 „ 8°·5
1780 „ 13°·9	1838 „ 8°·6	1858 „ 6°·8
1801 „ 5°·6	1841 „ 10°·9	1873 „ 7°·6
1803 „ 6°·0		

Thus it would seem that the increase this year has been exceeded seven times in the 102 years.

The reading of the barometer at 159 feet above sea level was about 29·6 in. at the beginning of January. A decrease, which reached its minimum (29·3 in.), occurred during the 1st and 2nd, but after this day generally increasing values were recorded till the 14th when 30 in. was reached. A very rapid decrease then set in and during the whole of the 20th the readings were but little in excess of 28·3 in., this continued depression being almost unprecedented. The mean daily values for the 19th, 20th, 21st, and 22nd were respectively 1·2 in., 1·1 in., 0·9 in., and 1·1 in., below the average. The above mentioned low readings were counterbalanced by a long continued wave of high values which lasted during the greater part of February, from the 9th to the 21st scarcely any values below 30 in. being recorded. There was a rapid decrease from 29°·52 on the morning of the 25th to 28°·69 on the afternoon of the 26th. During March frequent oscillations were recorded but the mean daily values were generally in defect of the average. The minimum of the month, 28·99 in. occurred on the 1st, and the maximum, 30·04 in. on the 26th, thus giving a range of 1·05 in. The principal movements were an increase to 29·9 in. on the 5th, *a decrease to 29·0 in. on the 11th*, a general increase to 30·0 in. on the 26th, and a decrease *to 29·5 in. on the 31st.*

E. & S.—550.—5/73.

A

The average atmospheric pressure at Greenwich in February was 0·325 inch greater than in January, and 0·278 inch greater than in March.

The average greater pressure in February from all stations was 0·412 inch over that in January and was 0·294 inch over that in March.

The mean temperature of January was 42°·1, being 5°·8 above the average of the preceding 102 years; and higher than in any year back to 1866 and then again to 1853, the temperature in those years being respectively 42°·6 and 42°·4.

The mean temperature of February was 34°·3, being 4°·3 lower than the average of the preceding 102 years, and lower than in any previous year back to 1855 when 29°·4 was recorded.

The mean temperature of March was 41°·9, being 0°·9 higher than the average of the preceding 102 years, lower than in 1872 and 1871, but higher than in 1870 and 1869.

The mean high day temperatures were respectively 3°·8 and 1°·6 higher than their averages in January and March, but 6°·3 lower in February.

The mean low night temperatures were higher than their respective averages in January and March by 4°·6 and 0°·1, but lower in February by 3°·3.

Therefore the days and nights were warm in January and March, but cold in February.

The daily ranges of temperature were less than their respective averages by 1°·6 and 3°·0 in January and February, but greater in March by 1°·5.

The fall of rain was 0·6 in. and 0·3 in. in excess of the average in January and February, but 0·4 in defect in March.

The mean temperature of the air in the three months ending February, constituting the three winter months, was 39°·8, being 1°·8 higher than the average of the preceding 102 years.

1873. Months.	Temperature of Air. Mean.	Air. Diff. from average of 102 years.	Air. Diff. from average of 32 years.	Evaporation. Mean.	Evaporation. Diff. from average of 32 years.	Dew Point. Mean.	Dew Point. Diff. from average of 32 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 32 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 32 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour. Diff. from average of 32 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
Jan. -	42·1	+5·8	+4·1	40·4	+3·7	38·2	+3·5	8·8	−1·6	42·5	0·231	+0·030	2·7	+0·4
Feb. -	34·3	−4·3	−5·0	32·8	−4·8	30·3	−4·7	8·4	−3·0	36·4	0·169	−0·037	2·0	−0·4
Mar. -	41·9	+0·9	+0·4	40·2	+1·0	38·2	+2·0	16·1	+1·5	42·1	0·231	+0·016	2·6	+0·1
Means -	39·4	+0·8	−0·2	37·8	0·0	35·6	+0·3	11·1	−1·0	40·3	0·210	+0·003	2·4	0·0

1873. Months.	Degree of Humidity. Mean.	Humidity. Diff. from average of 32 years.	Reading of Barometer. Mean.	Barometer. Diff. from average of 32 years.	Weight of a Cubic Foot of Air. Mean.	Weight. Diff. from average of 32 years.	Rain. Amount.	Rain. Diff. from average of 58 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
Jan. -	87	− 1	29·576	−0·173	546	−8	2·5	+0·6	413	10	17	4	18·5	43·9
Feb. -	85	0	29·901	+0·104	561	+8	1·9	+0·3	281	20	8	0	19·5	40·0
Mar. -	87	+ 5	29·623	−0·126	547	−3	1·3	−0·4	295	23	8	0	18·2	39·5
Means -	86	+ 1	29·700	−0·065	551	−1	Sum 5·7	Sum +0·2	Mean 330	Sum 53	Sum 33	Sum 4	Lowest 18·2	Highest 43·9

Note.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the plus sign (+) signifies above the average.

Thunderstorms occurred on the 2d of January at Lymington, Eccles, Stonyhurst, and Cockermouth; on the 3d at Lymington, Streatley, Llandudno, Hawarden, Hull, Stonyhurst, Cockermouth, Silloth, and Carlisle; on the 18th at Helston, Cockermouth, and Silloth; on the 19th at Guernsey, Truro, Brighton, Lymington, and Stonyhurst; on the 20th at Guernsey, Eastbourne, Brighton, and Stonyhurst; and on the 21st at Eastbourne. On the 10th of March at Guernsey, Royston, and Norwich; on the 11th at Wisbech; on the 14th at Helston; and on the 30th at Gloucester.

Thunder was heard, but lightning was not seen, on the 3d of January at Osborne, Strathfield Turgiss, and Streatley; on the 4th at North Shields; on the 18th at Salisbury and Streatley; on the 19th at Eastbourne and Oxford; and on the 21st at Somerleyton. On the 26th of February at Halifax; on the 27th at Helston; and on the 28th at Halifax. On the 10th of March at Carlisle; on the 11th at Somerleyton; and on the 30th at Guernsey, Brighton, and Weybridge.

Lightning was seen, but thunder was not heard, on the 2d of January at Portsmouth, Brighton, Streatley, and Carlisle; on the 3d at Osborne, Oxford, Royston, Liverpool, and Carlisle; on the 18th at Helston and Somerleyton; on the 19th at Osborne, Portsmouth, Strathfield Turgiss, Weybridge, Oxford, Cardington, Somerleyton, Norwich, Liverpool, Carlisle, and North Shields; on the 20th at Osborne, Portsmouth, Salisbury, Strathfield Turgiss, Weybridge, Marlborough, London, Oxford, Royston, Cardington, Somerleyton, Wisbech, Llandudno, Liverpool, and Cockermouth. On the 27th of February at Guernsey. On the 27th of March at Guernsey; and on the 30th at Guernsey, Osborne, and Portsmouth.

Solar halos were seen on the 1st of January at Brighton and Oxford; and at Oxford on January 23d, 29th, and February 22d.

Lunar halos were seen on the 6th of January at Stonyhurst; on the 7th at Weybridge and North Shields; on the 8th at Portsmouth, Brighton, and Wisbech; on the 10th at Brighton, Weybridge, London, Oxford, Wisbech, Bywell, and North Shields; on the 11th at Bywell and North Shields; on the 12th at Portsmouth, Weybridge, Oxford, Royston, Wisbech, Eccles, Hull, and North Shields; on the 13th at Wisbech, Bywell, and North Shields; on the 14th at North Shields; and on the 19th at Eccles. On the 3d of February at Stonyhurst; on the 5th at Brighton; on the 6th at Oxford; on the 7th at Portsmouth; on the 11th at London; on the 12th at Oxford and Stonyhurst; and on the 13th at North Shields. On the 3rd of March at London; on the 4th at Stonyhurst; on the 7th at Stonyhurst; on the 8th at Portsmouth, Oxford, and North Shields; on the 9th at Wisbech, Hull, York, and North Shields; on the 10th at Portsmouth, Oxford, Wisbech, Llandudno, and Cockermouth; on the 13th at North Shields; and on the 14th at Portsmouth, Brighton, and Oxford.

Auroræ Boreales were seen on the 3d of January at Brighton and Liverpool; on the 5th at North Shields; on the 7th at Eastbourne, Portsmouth, Brighton, Lymington, Weybridge, Oxford, Royston, and Stonyhurst; on the 10th at Carlisle; on the 16th at Streatley; and on the 19th at Weybridge. On the 20th of February at Stonyhurst; on the 22d at Cockermouth and Carlisle; on the 23d at Weybridge; and on the 27th at Carlisle and Bywell. On the 20th of March at Brighton; and on the 22d at Oxford and Wisbech.

Snow, with the exception of a little which fell at Cockermouth and Carlisle on 5th January, there was none till 19th January; throughout February falls were very frequent, excepting at places near the South Coast. It fell on eleven days in March at different places, but there was none recorded at any of the stations after 21st March.

Hail fell on the 2d of January at Guernsey, Truro, Salisbury, Royston, Cardington, Eccles, Stonyhurst, and Cockermouth; on the 3rd at Salisbury, Oxford, Llandudno, Liverpool, and Silloth; on the 5th at Guernsey, Eastbourne, Salisbury, Marlborough, Oxford, Liverpool, and Cockermouth; on the 18th at Truro, Stonyhurst, and Cockermouth; on the 19th at Guernsey, Truro, Eastbourne, Portsmouth, Lymington, Taunton, Oxford, Gloucester, Llandudno, Hawarden, Stonyhurst, and Carlisle; on the 20th at Guernsey, Helston, Truro, Eastbourne, Osborne, Portsmouth, Brighton, Taunton, Stonyhurst, and Carlisle; on the 21st at Guernsey, Truro, Eastbourne, and Llandudno; on the 22d at Truro and Eccles; on the 24th at Eastbourne; and on the 31st at North Shields. On the 1st of February at Hull; on the 2d at Helston; on the 3d at Helston; on the 7th at York and North Shields; on the 8th at Guernsey; on the 9th at Gloucester and North Shields; on the 10th at Strathfield Turgiss, Oxford, Hull, York, and North Shields; on the 11th at Hull and North Shields; on the 12th at Guernsey, Portsmouth, Weybridge, Hull, and North Shields; on the 13th at Truro; on the 22d at Hull; on the 23d at Truro and Llandudno; on the 25th at Oxford and Llandudno; on the 26th at Llandudno; on the 27th at Brighton, Salisbury, Strathfield Turgiss, and Gloucester; and on the 28th at Truro and Oxford. On the 5th of March at Salisbury; on the 6th at Strathfield Turgiss; on the 7th at Stonyhurst; on the 8th at Taunton and Oxford; on the 9th at Guernsey, Truro, Salisbury, and Weybridge; on the 10th at Guernsey, Helston, Brighton, Taunton, Salisbury, Llandudno, Eccles, Stonyhurst, Cockermouth, Silloth, and Carlisle; on the 11th at Guernsey, Brighton, Streatley, London, Royston, Wisbech, Liverpool, Eccles, and Carlisle; on the 12th at Truro; on the 13th at Truro and Lymington; on the 14th at Taunton, Oxford, and York; on the 15th at Guernsey, Hull, and York; on the 16th at Taunton; on the 21st at Lymington and Stonyhurst; and on the 31st at Salisbury.

Fog prevailed in January on 10 days, in February on 17 days, and in March on 17 days, mostly in the Midland Counties; there was very little fog at the stations near the South Coast.

Leaf buds first appeared on the field elm on the 20th of March at Brighton and Weybridge.

Leaf buds first appeared on the oak on the 24th of March at Helston.

Leaf buds first appeared on the lime on the 21st of March at Weybridge; on the 27th at Strathfield Turgiss; and on the 30th at Carlisle.

Leaf buds first appeared on the sycamore on the 3d of March at Weybridge; on the 4th at Strathfield Turgiss; on the 5th at Guernsey; and on the 31st at Carlisle.

Leaf buds first appeared on the horse chestnut on the 15th of March at Strathfield Turgiss and Weybridge; on the 25th at Taunton; and on the 31st at Carlisle.

Leaf buds first appeared on the hawthorn on the 12th of January at Eastbourne. On the 2d of March at Weybridge; on the 20th at Guernsey; on the 24th at Silloth; on the 27th at Carlisle; and on the 28th at Brighton.

Leaf buds first appeared on the hornbean on the 28th of March at Carlisle.

Sycamore in leaf on the 29th of March at Helston.

Horse chestnut in leaf on the 27th of March at Helston.

Hawthorn in leaf on the 28th of March at Helston; and on the 30th at Taunton.

Gooseberry in leaf on the 24th of February at Helston.

Common Poplar in flower on the 22d of March at Brighton.

Primroses in blossom on the 4th of January at Guernsey.

Hardy Pear in blossom on the 8th of March at Helston.

Peach in blossom on the 25th of February at Helston. On the 25th of March at Oxford; on the 26th at Wisbech; and on the 28th at Lymington.

Plum in blossom on the 27th of March at Strathfield Turgiss; on the 28th at Oxford and Lymington; and on the 30th at Silloth.

The Daffodil and Red Flowering Currant in blossom on the 4th of March at Brighton.

Swallow arrived at Guernsey on the 28th of March; and at Taunton on the 31st.

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MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING MARCH 31st, 1873.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat.^{n} = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S.	204	Jan.	29·551	1·666	53·5	31·5	22·0	48·2	40·9	7·3	44·5	41·2	·259	2·9	0·4	88	543	—	—	1·7	3	7	13	8	4·5	6·0	22	6·63
		Feb.	29·832	1·684	51·0	31·5	19·5	44·0	36·7	7·3	39·8	36·9	·220	2·6	0·3	90	554	—	—	1·5	10	8	5	5	—	6·7	17	3·31
		Mar.	29·550	0·965	57·0	34·0	23·0	49·3	40·0	9·3	44·5	43·5	·281	3·2	0·2	96	543	—	—	1·4	9	10	6	6	4·8	5·9	18	3·86
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	105	Jan.	29·681	2·078	56·0	32·0	24·0	51·4	42·9	8·5	47·8	40·4	·251	3·1	0·9	77	540	55·0	39·0	2·2	4	3	11	13	5·8	6·6	23	4·97
		Feb.	30·071	1·716	55·0	31·0	24·0	48·4	39·0	9·4	43·0	35·2	·205	2·6	0·8	76	552	46·3	37·1	2·0	14	6	4	4	4·7	6·0	15	3·89
		Mar.	29·803	1·031	63·0	30·0	33·0	52·8	42·3	10·5	46·6	39·4	·241	3·0	1·0	74	541	68·4	39·0	2·6	9	10	5	7	5·5	5·3	20	5·59
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	Jan.	29·675	1·652	55·0	27·0	28·0	49·8	41·6	8·2	45·2	41·6	·263	3·1	0·5	88	545	—	—	3·0	4	3	12	12	—	8·4	25	5·32
		Feb.	30·068	1·705	53·0	27·0	26·0	45·5	36·3	9·2	40·1	35·8	·211	2·4	0·5	85	558	—	—	2·5	13	9	3	3	—	7·7	15	5·03
		Mar.	29·747	1·013	59·0	27·0	32·0	51·1	40·3	10·8	44·4	40·5	·254	2·9	0·5	87	547	—	—	2·8	9	10	4	8	—	7·2	18	4·05
SIDMOUTH (Devon), J. Ingleby Mackenzie, Esq., M.B., F.M.S.	30	Jan.	29·701	1·705	53·5	28·6	24·9	47·6	39·6	8·0	43·6	42·2	·270	3·1	0·3	95	547	—	—	1·7	4	3	5	19	—	4·7	22	4·59
		Feb.	30·079	1·962	51·7	27·2	24·5	42·1	33·5	8·6	37·6	35·0	·204	2·4	0·2	91	561	—	—	0·8	13	10	0	5	—	4·3	9	3·50
EASTBOURNE (Sussex), Miss W. L. Hall.	12	Jan.	29·779	1·703	53·2	28·0	25·2	47·4	40·6	6·8	44·3	41·2	·249	2·9	0·4	85	547	57·9	34·2	0·7	2	4	12	13	5·0	—	20	3·81
OSBORNE (Isle of Wight), J. R. Mann, Esq.	172	Jan.	29·579	1·717	53·2	26·6	26·6	47·1	38·0	9·1	42·6	40·0	·248	2·9	0·3	90	546	55·0	37·2	0·2	3	4	14	10	—	7·5	21	4·62
		Feb.	29·900	1·807	48·8	26·4	22·4	40·6	32·1	8·5	35·8	33·3	·193	2·2	0·3	91	559	50·9	31·2	0·3	13	8	3	4	—	9·0	12	2·77
		Mar.	29·610	1·036	63·3	31·3	32·0	51·5	38·8	12·7	43·7	41·1	·259	2·9	0·3	90	545	83·4	32·3	0·2	10	10	5	6	—	5·8	16	2·10
BOURNEMOUTH (Hants), T. A. Compton, Esq., M.D., B.A., F.M.S.	128	Jan.	29·765	1·720	52·3	30·0	22·3	47·2	40·3	6·9	43·6	37·7	·226	2·6	0·6	79	548	—	—	—	6	2	7	16	—	5·6	21	4·92
		Feb.	30·095	1·870	46·4	27·0	19·4	40·5	33·0	7·5	36·3	32·1	·183	2·1	0·4	84	563	—	—	—	17	6	1	4	—	7·4	10	2·64
		Mar.	29·772	0·850	59·1	29·9	29·2	49·6	37·9	11·7	42·9	38·7	·235	2·7	0·5	84	549	—	—	—	9	7	6	9	—	4·1	15	3·70
PORTSMOUTH, William O. Ellis, Esq., F.M.S.	16	Jan.	29·769	1·711	54·8	25·4	29·4	47·8	35·9	11·9	42·5	40·3	·250	2·9	0·4	92	549	62·6	30·1	1·6	2	4	14	11	2·8	8·0	21	4·38
		Feb.	30·083	1·872	49·4	19·6	29·8	41·6	28·0	13·6	34·9	33·7	·195	2·0	0·3	85	564	55·2	24·0	1·1	18	5	1	4	1·1	8·9	10	1·84
		Mar.	29·792	1·026	61·6	28·0	33·6	51·9	33·3	18·6	42·3	37·9	·228	2·7	0·6	85	550	86·7	27·7	1·2	6	10	8	7	2·3	7·0	19	2·07
WORTHING (Sussex), W. J. Harris, Esq., M.R.C.S.E., L.S.A.	31	Jan.	29·741	1·716	52·2	28·9	23·3	47·1	40·3	6·8	43·6	40·9	·257	3·0	0·3	90	547	63·5	34·0	1·2	3	4	11	13	6·9	7·0	19	2·81
		Feb.	30·037	1·841	49·0	27·0	22·0	40·2	32·3	7·9	35·8	33·1	·190	2·2	0·2	90	562	61·4	29·8	0·9	17	6	2	3	2·2	8·2	12	2·69
		Mar.	29·754	0·997	60·9	29·5	31·4	50·3	38·3	12·0	43·4	39·0	·238	2·7	0·5	84	548	93·7	34·4	1·0	6	8	8	9	5·0	6·0	16	1·77
BRIGHTON (Sussex), Frederick E. Sawyer, Esq., F.M.S.	200	Jan.	29·582	1·761	52·4	29·3	23·1	45·6	39·5	6·1	42·5	40·1	·249	2·9	0·3	91	549	68·4	34·3	1·3	3	3	14	11	—	8·3	22	2·68
		Feb.	29·848	1·899	49·4	26·6	22·8	39·3	31·7	7·6	35·2	31·8	·180	2·1	0·3	89	559	61·5	29·0	0·9	15	7	2	4	—	8·8	16	1·97
		Mar.	29·579	0·954	61·4	29·3	32·1	49·2	38·6	10·6	43·2	39·3	·240	2·7	0·5	86	545	92·9	33·3	1·2	9	8	9	5	—	6·7	—	—
LYMINGTON (Hants), George J. Jones, Esq.	77	Jan.	29·669	1·674	53·2	27·8	25·4	46·9	40·6	6·3	43·7	40·4	·252	2·9	0·3	88	546	—	38·6	1·1	2	5	10	14	—	7·0	18	4·11
		Feb.	30·008	1·785	48·8	26·8	22·0	40·3	33·2	7·1	36·3	33·1	·190	2·2	0·4	89	561	—	31·4	1·4	13	9	3	3	—	8·5	12	2·62
		Mar.	29·708	0·890	64·0	30·1	33·9	51·4	37·6	13·8	43·5	39·3	·241	2·8	0·5	85	547	—	34·8	1·4	8	10	4	9	—	5·8	17	3·02
TAUNTON (Somerset), Rev. W. Tuckwell, F.M.S.	80	Jan.	29·641	1·788	54·5	26·0	28·5	48·7	38·2	10·5	43·8	40·5	·253	2·9	0·3	88	545	52·6	35·2	0·6	2	3	12	14	7·5	6·5	19	3·98
		Feb.	30·022	1·911	58·7	14·2	44·5	41·7	30·8	10·9	36·3	33·6	·194	2·2	0·3	91	561	46·8	30·5	0·2	9	12	5	2	6·0	8·0	5	1·21
		Mar.	29·699	1·068	65·0	25·1	39·9	51·0	33·4	17·6	42·1	40·8	·255	2·9	0·2	95	548	61·5	31·0	0·1	6	8	3	9	7·0	5·6	18	3·43
WILTON HOUSE (near Salisbury),	188	Jan.	29·540	1·715	57·5	22·5	35·0	47·5	35·9	11·6	42·0	39·8	·245	2·8	0·3	92	545	68·2	34·4	1·4	4	5	14	8	6·2	7·2	20	5·00
		Feb.	[illegible]	1·813	53·0	23·5	29·5	41·2	30·4	10·8	35·5	32·2	·183	2·1	0·4	88	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	…perature. Air.	Dew Point.	Elastic Force.	In a Cubic foot of Air. Mean.	In a Cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of cubic foot of Air.	Reading of Thermometer. Maximum in Rays of Sun.	Reading of Thermometer. Minimum on Grass.	Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount Ozone.	Mean Amount Cloud.	Number of Days it fell.	Amount collected.
	feet		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
ALDERSHOT CAMP (Hants), John Arnold, Esq., M.S.C., F.M.S.	325	Jan.	29·375	1·689	52·8	24·8	28·0	46·0	36·7	9·3	41·4	37·9	·233	2·6	0·4	90	543	60·4	31·8	1·6	2	5	14	10	2·1	7·5	19	4·17
		Feb.	29·699	1·870	49·0	25·2	23·8	39·8	30·4	9·4	34·2	31·5	·178	2·1	0·3	89	558	56·6	27·5	1·4	12	6	3	7	2·1	9·0	13	2·38
		Mar.	29·424	0·925	68·4	27·8	20·6	51·3	35·1	16·2	41·8	38·4	·234	2·8	0·4	88	544	83·0	30·7	1·5	6	11	7	7	2·4	7·2	20	2·51
STRATHFIELD TURGISS (Hants), Rev. C. H. Griffith, M.A., F.M.S.	197	Jan.	29·536	1·675	53·6	35·1	18·5	45·5	37·2	8·3	41·7	37·6	·225	2·6	0·4	87	546	69·8	31·0	0·7	1	6	11	13	4·0	6·4	14	3·11
		Feb.	29·878	1·893	50·2	24·0	26·2	39·6	31·2	8·4	34·8	32·7	·186	2·1	0·2	92	560	61·6	30·0	0·6	12	6	4	6	3·0	9·0	12	1·68
		Mar.	29·591	1·035	67·2	29·2	38·0	50·2	35·1	15·1	42·4	36·6	·217	2·5	0·6	81	546	95·1	30·0	0·7	6	12	6	7	—	6·6	21	2·20
WEYBRIDGE HEATH (Surrey), William F. Harrison, Esq., F.M.S.	150	Jan.	29·621	1·681	53·0	21·3	31·7	45·9	36·0	9·9	41·2	37·9	·227	2·6	0·4	80	548	59·2	34·2	1·0	3	4	16	8	1·8	6·0	17	2·68
		Feb.	29·954	1·818	47·0	24·0	23·0	39·0	31·0	8·0	34·7	31·2	·175	2·1	0·3	87	562	54·9	30·3	0·8	9	7	9	3	0·7	8·4	8	1·98
		Mar.	29·661	0·980	70·8	25·8	45·0	51·6	34·8	16·8	41·9	38·6	·235	2·7	0·4	89	548	80·6	32·5	0·8	9	9	8	5	1·4	7·4	21	1·65
MARLBOROUGH COLLEGE (Wilts), Rev. Thomas A. Preston, M.A.	456	Jan.	29·256	1·690	53·0	23·3	29·7	45·1	36·0	9·1	40·6	37·7	·220	2·8	0·2	90	542	58·7	32·6	—	1	5	14	11	5·0	7·4	22	4·38
		Feb.	29·616	1·866	48·5	22·9	25·6	38·6	30·1	8·5	33·7	31·2	·175	2·1	0·2	89	557	55·9	28·9	—	11	11	2	4	4·0	9·0	12	1·40
		Mar.	29·298	1·085	63·3	24·7	38·6	49·5	34·7	14·8	40·8	38·5	·234	2·7	0·4	92	543	86·4	31·1	—	5	13	7	6	4·0	6·9	21	2·79
ROYAL OBSERVATORY (Kent), The Astronomer Royal.	159	Jan.	29·576	1·712	53·8	26·0	27·8	46·8	38·0	8·8	42·1	38·2	·231	2·7	0·5	87	546	62·8	32·5	0·8	2	5	12	12	—	6·9	15	2·45
		Feb.	29·901	1·929	50·1	25·0	25·1	39·2	30·8	8·4	34·6	30·3	·169	2·0	0·4	85	561	49·9	28·0	0·5	11	7	4	6	—	9·2	11	1·93
		Mar.	29·623	1·050	64·6	27·2	37·4	51·3	35·2	16·1	41·9	38·2	·231	2·6	0·4	87	547	87·0	29·1	0·5	7	11	6	7	—	6·5	15	1·33
THE GUILDHALL (London), William Haywood, Esq.		Jan.	29·548	1·707	55·0	32·8	22·2	47·5	41·2	6·3	44·4	39·0	·238	2·7	0·6	81	543	—	—	—	-	-	-	-	—	—	19	2·45
		Feb.	29·889	1·977	49·2	28·0	41·2	40·3	33·2	7·1	36·5	31·6	·179	2·1	0·5	83	559	—	—	—	-	-	-	-	—	—	10	1·85
STREATLEY VICARAGE (Berks), Rev. J. Slatter, M.A., F.R.A.S.	150	Jan.	29·614	1·691	54·2	23·2	31·0	47·2	36·9	10·3	42·3	39·5	·242	2·8	0·4	90	546	51·8	—	1·5	2	6	13	10	—	7·1	15	3·57
		Feb.	29·929	1·909	50·0	24·8	25·2	39·3	30·7	8·6	35·3	32·6	·185	2·2	0·3	90	560	44·5	—	1·4	6	8	7	7	—	9·0	8	1·60
		Mar.	29·695	1·016	67·5	27·0	40·5	51·5	36·5	15·4	42·7	39·2	·239	2·0	0·4	87	548	59·1	—	1·5	8	9	6	8	—	7·1	21	2·38
ST. JOHN'S COLLEGE, BATTERSEA, Rev. J. P. Faunthorpe, M.A., F.R.G.S.	13	Dec.	29·549	1·131	56·0	24·0	32·0	47·9	35·6	12·3	42·6	40·9	·257	2·9	0·3	93	545	49·9	30·0	1·7	1	2	16	12	—	7·3	18	4·50
		Jan.	29·692	1·710	58·0	25·0	33·0	47·9	35·7	12·2	42·2	39·1	·239	2·8	0·3	90	548	49·5	30·5	1·6	0	3	17	11	—	7·3	13	2·77
		Feb.	30·021	1·929	50·0	20·0	30·0	40·0	28·3	11·7	34·3	31·5	·178	2·1	0·3	90	563	46·0	27·0	1·5	5	5	10	8	—	9·1	10	2·26
		Mar.	29·748	1·079	65·0	26·0	39·0	51·4	32·9	18·5	41·3	37·4	·225	2·6	0·4	87	530	63·6	28·7	1·7	6	11	8	6	—	6·9	19	1·76
CAMDEN TOWN (London), G. J. Symons, Esq., F.M.S.	123	Jan.	29·620	1·702	53·9	28·8	25·1	46·7	38·3	8·4	42·6	38·2	·231	2·6	0·4	85	546	52·1	35·0	—	3	2	10	16	—	6·8	18	2·44
		Feb.	29·952	1·853	50·1	25·8	24·3	39·5	31·3	8·2	35·2	31·1	·174	2·1	0·3	84	561	48·4	30·1	—	15	6	1	6	—	9·0	13	1·96
		Mar.	29·667	0·999	63·7	29·2	34·5	51·2	35·6	15·6	42·6	39·6	·243	2·7	0·4	87	547	74·9	33·4	—	14	8	5	4	—	6·4	17	1·46
CHISWICK (London), Thiselton Dyer, Esq.	25	Jan.	29·722	1·673	55·5	25·0	30·5	47·6	37·5	10·1	42·1	38·6	·234	2·7	0·4	88	549	59·9	34·3	—	3	4	16	8	—	—	17	2·89
		Feb.	30·033	1·890	47·0	25·5	21·5	39·7	31·6	8·1	35·1	31·8	·180	2·1	0·4	87	563	52·7	30·4	—	15	4	3	6	—	—	9	1·56
		Mar.	29·775	1·078	65·0	26·0	39·0	51·6	34·9	16·7	42·1	38·3	·232	2·7	0·4	87	550	75·7	33·6	—	11	8	7	5	—	—	17	1·53
OXFORD (Oxfordshire), Rev. R. Main, M.A., F.R.S., F.R.A.S.	210	Jan.	29·497	1·737	53·9	24·3	29·6	46·1	37·7	8·4	42·0	37·1	·221	2·6	0·5	84	545	74·0	35·0	1·4	2	5	16	8	2·6	8·2	18	2·20
		Feb.	29·860	1·953	49·8	25·0	24·8	39·5	31·9	7·6	33·3	31·2	·176	2·1	0·4	86	559	64·0	30·5	0·9	11	4	6	7	1·7	9·2	14	1·61
		Mar.	29·585	1·195	63·8	27·2	36·6	49·6	36·0	13·6	42·4	38·0	·229	2·7	0·5	85	546	90·3	33·2	1·7	9	8	7	7	2·8	7·6	20	2·35
GLOUCESTER (Gloucester), E. Toller, Esq., M.D.	100	Jan.	29·679	1·741	56·5	24·1	32·4	47·7	38·1	9·6	42·7	37·9	·228	2·6	0·5	84	547	62·1	36·5	1·0	3	2	12	14	1·6	6·7	18	3·38
		Feb.	30·052	1·938	47·2	25·1	22·1	41·0	32·0	9·0	36·1	30·8	·174	2·0	0·5	81	542	56·5	31·6	0·5	10	8	4	6	1·1	8·2	12	0·83
		Mar.	29·731	1·006	60·7	24·2	36·5	51·3	34·7	16·6	42·3	36·8	·218	2·5	0·6	82	549	80·5	33·7	0·8	8	8	7	8	2·0	6·4	17	2·89
ROYSTON (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	Jan.	29·459	1·707	53·8	25·0	28·8	46·6	36·4	10·2	41·6	37·1	·221	2·6	0·5	85	545	—	—	—	3	3	16	9	—	6·2	17	2·64
		Feb.	29·802	1·875	49·5	21·9	27·6	39·5	29·5	10·0	34·2	30·9	·174	2·1	0·2	87	559	—	—	—	11	4	4	9	—	8·5	14	2·32
		Mar.	29·548	1·054	68·2	27·8	40·4	51·6	33·5	18·1	41·0	38·3	·231	2·6	0·4	90	547	—	—	—	8	8	8	7	—	7·2	18	1·49
CARDINGTON (near Bedford), Mr. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	105	Jan.	29·629	1·710	54·0	25·0	29·0	46·2	36·2	10·0	41·1	37·9	·229	2·6	0·4	89	548	48·1	30·1	1·2	0	6	12	13	—	6·0	—	2·15
		Feb.	29·997	1·886	52·0	23·0	29·0	39·7	30·9	8·8	34·9	31·4	·176	2·1	0·3	86	562	46·5	27·7	0·8	12	5	5	6	—	8·4	—	1·46
		Mar.	29·718	1·122	63·0	27·0	36·0	49·7	34·1	15·6	40·8	36·7	·215	2·5	0·4	83	550	65·2	28·4	1·0	6	12	7	6	—	7·5	—	1·46
ST. DAVID'S COLLEGE, LAMPETER (Cardiganshire), Prof. A. W. Scott.	420	Dec.	29·131	1·198	58·5	18·0	40·5	50·4	30·9	19·5	40·4	35·9	·212	2·5	0·4	84	540	61·4	—	—	5	8	13	5	—	—	19	8·84
		Jan.	29·163	1·374	56·0	27·0	29·0	50·9	32·0	18·9	41·7	35·7	·209	2·4	0·6	80	539	61·7	—	—	1	5	19	6	—	—	23	5·20
		Feb.	29·717	1·079	52·0	17·0	35·0	41·5	29·5	12·0	35·4	30·8	·173	2·1	0·4	83	557	56·6	—	—	10	8	5	5	—	—	6	1·58
		Mar.	29·398	1·474	66·0	22·5	43·5	51·7	34·9	16·8	42·5	38·1	·230	2·7	0·6	85	542	89·3	—	—	7	11	8	5	—	—	13	3·00
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	Jan.	29·680	1·664	53·4	26·2	27·2	46·1	36·7	9·4	41·4	39·6	·244	2·9	0·2	94	549	—	27·4	1·0	3	4	11	13	7·3	6·4	16	1·65
		Feb.	30·019	1·919	51·2	24·8	26·4	40·2	31·1	9·1	35·3	34·0	·197	2·3	0·2	95	562	—	24·4	0·8	10	6	5	7	7·0	8·5	14	1·64
		Mar.	29·758	1·069	62·3	24·4	37·9	45·8	34·4	14·4	41·5	38·8	·238	2·7	0·4	88	550	—	25·0	1·1	7	12	6	6	7·6	5·4	16	1·75

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
NORWICH (Norfolk), C. M. Gibson, Esq., F.M.S.	42	Jan.	29·681	1·715	53·5	26·0	27·5	45·1	35·9	9·2	40·6	38·1	·230	2·7	0·3	91	550	—	—	—	5	4	13	9	—	—	16	2·22
		Feb.	30·027	1·960	50·0	21·5	28·5	38·9	29·9	9·0	34·2	32·3	·184	2·2	0·2	93	564	—	—	—	9	5	3	11	—	—	12	1·93
		Mar.	29·703	1·092	58·0	26·5	31·5	47·1	33·3	13·8	39·7	37·9	·228	2·7	0·2	94	552	—	—	—	7	12	6	6	—	—	14	1·68
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	Jan.	29·684	1·715	55·0	22·0	33·0	46·0	36·7	9·3	40·4	38·4	·236	2·7	0·2	93	550	65·0	33·4	0·7	3	7	13	8	5·9	6·3	16	1·88
		Feb.	30·065	2·004	50·0	25·0	25·0	39·5	31·3	8·2	34·6	33·0	·189	2·2	0·1	94	564	56·9	28·8	0·5	9	5	6	8	1·9	8·8	14	1·69
		Mar.	29·786	1·122	65·0	26·5	38·5	49·5	34·7	14·8	40·9	39·0	·237	2·8	0·2	93	551	84·3	31·0	0·7	10	10	6	5	2·6	7·0	19	1·56
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	Jan.	29·491	1·785	54·9	28·4	26·5	47·9	38·6	9·3	43·3	38·2	·230	2·7	0·5	81	543	—	—	0·8	2	2	10	17	—	6·8	22	5·81
		Feb.	30·029	1·981	50·0	25·6	24·4	42·3	33·6	8·7	38·5	32·7	·185	2·2	0·5	79	559	—	—	0·8	7	5	2	14	—	7·7	11	1·23
		Mar.	29·682	1·103	68·7	30·6	38·1	50·0	37·6	12·4	43·6	37·7	·236	2·6	0·6	79	547	—	—	0·6	3	13	6	9	—	6·7	12	2·09
DERBY (Derbyshire), John Davis, Esq.	174	Jan.	29·466	1·722	55·0	24·0	31·0	45·3	36·8	8·5	40·9	37·8	·227	2·7	0·4	89	546	—	—	—	1	5	16	9	—	—	14	2·04
		Feb.	29·902	1·967	50·0	22·0	28·0	40·3	31·1	9·2	35·4	32·3	·184	2·1	0·3	89	560	—	—	—	8	4	5	11	—	—	11	0·68
		Mar.	29·605	1·152	61·0	27·0	34·0	47·6	34·5	13·1	40·2	35·7	·213	2·6	0·9	86	549	—	—	—	7	10	6	8	—	—	14	2·15
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	241	Jan.	29·393	1·735	55·0	19·1	35·9	46·2	38·2	8·0	41·6	38·5	·233	2·7	0·2	89	543	—	28·0	0·5	3	5	17	6	0·5	6·9	20	2·19
		Feb.	29·825	1·947	51·5	20·3	31·2	40·2	29·5	10·7	34·4	31·2	·176	2·1	0·2	89	569	—	22·2	0·7	11	5	4	8	0·3	6·9	14	0·91
		Mar.	29·536	1·113	63·8	24·2	39·6	49·3	33·7	15·6	40·3	37·6	·225	2·6	0·2	90	547	59·4	25·6	0·7	7	12	6	6	1·0	8·2	19	1·92
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	Dec.	29·522	1·224	53·0	26·2	26·8	45·9	35·4	10·5	41·4	38·2	·231	2·7	0·4	89	546	51·5	28·7	1·2	6	4	16	5	—	7·3	19	3·30
		Jan.	29·666	1·705	54·5	23·5	31·0	46·1	35·7	10·4	41·2	37·0	·220	2·5	0·5	85	549	56·5	29·3	1·6	1	4	22	4	—	6·2	16	1·80
		Feb.	30·084	1·514	51·2	15·6	35·6	40·1	29·4	10·7	34·9	30·1	·167	2·0	0·4	81	563	59·0	24·4	1·0	10	5	7	16	—	8·5	14	3·18
HAWARDEN (Flint), T. Moffat, Esq., M.D., F.R.A.S.	270	Jan.	29·332	1·744	53·5	27·0	26·5	44·6	37·9	6·7	40·7	37·8	·227	2·5	0·4	89	543	61·2	18·6	2·3	4	3	14	10	2·6	6·9	20	2·15
		Feb.	29·782	1·938	47·0	25·0	22·0	39·2	32·4	6·8	35·6	32·5	·184	2·1	0·4	86	558	68·2	15·5	1·8	12	4	4	8	2·0	6·7	15	0·89
		Mar.	29·510	1·164	60·0	30·0	30·0	47·1	36·2	10·9	40·2	37·5	·224	2·6	0·3	90	547	84·2	17·3	2·0	7	8	12	4	1·2	6·8	19	3·44
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	Jan.	29·421	1·776	55·0	28·2	26·8	46·8	38·2	8·6	42·2	37·3	·233	2·6	0·5	84	543	—	—	1·6	1	7	15	8	—	6·9	19	2·19
		Feb.	29·926	1·888	49·7	24·1	25·6	40·8	32·3	8·5	36·2	32·2	·184	2·1	0·4	86	560	—	—	1·1	9	5	5	9	—	7·6	8	0·45
		Mar.	29·603	1·148	62·4	29·8	32·6	47·8	35·8	12·0	41·1	36·2	·212	2·4	0·6	82	548	—	—	1·3	8	14	5	4	—	6·3	15	2·74
ECCLES (near Manchester), T. Mackereth, Esq., F.R.A.S., F.M.S.	145	Jan.	29·474	1·800	54·5	24·0	30·5	46·2	36·2	10·0	41·3	36·8	·218	2·5	0·5	85	545	49·1	29·3	1·0	2	6	16	7	4·3	6·6	21	3·81
		Feb.	29·960	1·958	47·6	14·6	33·0	41·1	29·8	11·3	35·5	31·0	·174	2·0	0·5	84	561	45·8	24·1	0·4	9	7	5	7	1·6	7·6	17	0·55
		Mar.	29·643	1·154	65·5	27·2	38·3	49·8	34·2	15·6	41·7	36·5	·216	2·5	0·6	83	548	60·6	27·2	0·2	6	12	8	5	2·0	5·9	17	2·69
MOOR SIDE OBSERVATORY, HALIFAX, (Yorkshire), Louis J. Crossley, Esq., F.M.S.	429	Jan.	29·082	1·817	52·5	16·5	36·0	44·1	34·6	9·5	39·2	36·5	·216	2·5	0·3	90	540	57·6	31·1	—	2	6	13	10	2·8	6·4	22	4·32
		Feb.	29·552	1·932	49·4	6·0	43·4	39·5	32·0	7·5	34·6	32·0	·182	2·2	0·2	92	554	59·4	27·0	1·1	12	4	3	9	3·9	8·4	14	0·70
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	Jan.	29·620	1·835	53·0	23·0	30·0	44·7	36·0	8·7	40·4	37·4	·223	2·7	0·3	90	549	54·2	33·3	—	-	-	-	-	4·4	—	15	1·91
		Feb.	30·080	1·962	49·0	12·0	37·0	39·9	30·2	9·7	34·6	32·0	·182	2·1	0·3	91	564	53·6	28·1	—	-	-	-	-	3·1	—	17	1·72
		Mar.	29·804	1·131	56·0	24·0	32·0	45·7	33·5	12·2	38·2	36·5	·216	2·5	0·4	95	555	64·4	31·4	—	-	-	-	-	2·4	—	17	2·48
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	363	Jan.	29·232	1·850	52·6	18·7	33·9	44·8	36·3	8·5	40·2	36·8	·218	2·5	0·4	89	542	66·2	31·5	—	2	5	15	9	—	7·7	28	6·17
		Feb.	29·715	1·950	44·8	12·3	32·5	40·4	31·3	9·1	35·2	32·5	·183	2·1	0·3	89	557	71·2	26·5	—	10	4	2	12	—	7·7	16	0·82
		Mar.	29·407	1·198	60·7	28·8	31·9	47·6	35·8	11·8	40·5	34·5	·200	2·3	0·4	80	545	90·9	30·1	—	7	14	4	6	—	7·3	25	3·40
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	Jan.	29·184	1·822	54·8	22·8	32·0	46·3	36·9	9·4	41·1	38·4	·232	2·7	0·3	90	540	49·4	—	1·6	-	-	-	-	—	4·7	19	3·22
		Feb.	29·680	1·917	48·8	27·2	21·6	41·9	32·2	9·7	36·8	33·0	·188	2·2	0·3	87	554	49·1	—	0·8	-	-	-	-	—	6·1	—	—
		Mar.	29·377	1·219	58·0	28·8	29·2	46·3	35·0	11·3	40·1	36·2	·203	2·5	0·4	86	545	59·6	—	1·0	-	-	-	-	—	5·4	14	2·90
LEEDS PHILOSOPHICAL HALL (Yorkshire), Louis C. Miall, Esq.	137	Jan.	29·476	1·839	53·0	24·0	29·0	45·4	32·8	12·6	40·3	34·6	·200	2·3	0·6	80	547	51·0	—	1·5	2	4	8	17	—	8·7	19	2·37
		Feb.	29·956	1·961	52·0	15·0	37·0	41·0	30·9	10·1	36·2	30·1	·175	1·9	0·6	79	560	49·7	—	1·2	13	5	2	8	—	9·2	14	0·88
		Mar.	29·654	1·190	62·0	28·0	34·0	47·9	34·0	13·9	40·4	36·0	·213	2·5	0·4	85	550	56·8	—	1·4	8	11	6	6	—	7·3	18	2·28
YORK (Yorkshire), J. F. Fryer, Esq.	50	Jan.	29·547	1·886	51·5	17·0	34·5	41·7	33·7	8·0	38·2	37·7	·226	2·7	0·1	98	550	—	—	—	-	-	-	-	—	—	14	2·95
		Feb.	29·995	1·973	45·0	10·0	35·0	38·7	29·8	8·9	34·3	31·8	·180	2·1	0·2	90	563	—	—	—	4	13	8	3	—	—	15	1·29
		Mar.	29·727	1·256	57·0	27·0	30·0	44·6	33·7	10·9	38·4	37·0	·220	2·5	0·4	95	553	—	—	—	6	12	9	2	—	—	15	2·16
COCKERMOUTH (Cumberland), H. Dodgson, Esq., M.D., F.R.A.S., F.M.S.	146	Jan.	29·879	2·086	52·2	22·6	29·6	45·4	36·7	8·7	41·1	36·4	·214	2·5	0·5	[illegible]	544	[illegible]	[illegible]	1·1	2	7	[illegible]	9	0·7	6·2	[illegible]	[illegible]
		Feb.	29·964	1·940	47·6	11·5	36·1	41·4	30·2	11·2	[illegible]	[illegible]	·176	2·1	0·5	[illegible]	561	[illegible]	[illegible]	[illegible]	[illegible]	8	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Mar.	29·622	1·248	66·8	25·0	41·8	50·0	35·8	14·2	42·4	[illegible]	·219	2·5	0·6	81	547	[illegible]	[illegible]	[illegible]	[illegible]	13	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Names and Stations and Observers.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Dew Point.	Vapour. Elastic Force.	In a cubic foot of Air. Mean.	Short of Saturation.	Mean Degree of Humidity. Sat. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Minimum on Grass.	Wind. Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
ALLENHEADS (Northumberland), Mr. S. Stobbs, Assistant to W. B. Beaumont, Esq., M.P.	1360	Jan.	28·098	1·849	50·0	21·5	28·5	41·4	32·0	9·4	36·0	34·2	·199	2·3	0·2	94	525	58·1	30·9	2·1	—	—	—	—	—	5·9	25	6·32
		Feb.	28·607	1·835	45·0	13·0	32·0	39·2	27·6	11·6	31·9	29·3	·166	2·0	0·1	93	540	57·8	27·4	1·4	—	—	—	—	—	5·4	14	1·53
		Mar.	28·292	1·134	54·0	19·0	35·0	43·5	30·3	13·2	36·0	34·3	·199	2·3	0·2	94	529	72·9	29·0	1·2	—	—	—	—	—	4·6	21	3·10
SILLOTH RECTORY (Cumberland), Rev. Francis Redford, M.A., F.R.A.S., F.M.S.	28	Jan.	29·498	1·978	52·0	24·0	28·0	46·7	36·2	10·5	41·0	37·8	·227	2·6	0·3	89	546	61·7	31·0	—	2	6	9	14	9·5	7·3	20	6·43
		Feb.	30·082	1·954	51·8	13·4	38·4	42·5	31·7	10·8	36·0	31·5	·179	2·0	0·4	84	563	63·9	27·8	—	6	10	4	8	4·0	6·6	3	0·75
		Mar.	29·746	1·249	68·9	25·5	43·4	50·7	34·6	16·1	41·4	37·2	·224	2·6	0·5	87	550	82·2	30·2	—	2	20	3	6	7·4	6·5	14	2·32
CARLISLE (Cumberland), J. Cartmell, Esq., F.M.S.	114	Jan.	29·410	1·962	53·0	21·4	31·6	45·3	34·7	10·6	39·9	37·0	·220	2·5	0·4	89	545	54·1	30·0	1·9	3	4	16	8	6·6	7·4	20	4·44
		Feb.	29·999	1·942	48·5	10·5	38·0	40·5	27·9	12·6	34·2	31·0	·174	2·0	0·3	88	563	55·9	23·3	1·1	7	6	6	9	5·6	7·1	4	0·60
		Mar.	29·672	1·203	67·3	27·7	39·6	49·2	33·8	15·4	41·7	37·2	·223	2·5	0·5	87	549	75·1	28·9	1·5	7	12	6	6	5·4	6·3	12	1·90
BYWELL (Northumberland), Mr. John Dawson, Assistant to W. B. Beaumont, Esq., M.P.	87	Jan.	29·420	1·859	56·0	26·0	30·0	46·4	37·3	9·1	41·1	35·3	·207	2·4	0·6	80	545	50·0	30·9	1·2	0	5	10	16	—	6·5	21	2·14
		Feb.	29·982	1·889	51·0	19·0	32·0	42·1	32·1	10·0	36·3	30·6	·172	2·0	0·5	80	550	46·2	25·3	1·1	8	5	3	12	—	6·3	15	1·65
		Mar.	29·683	1·123	58·0	27·0	31·0	46·9	35·6	11·3	40·0	34·3	·198	2·3	0·6	80	551	52·8	29·5	1·2	4	16	4	7	—	6·4	23	2·18
NORTH SHIELDS (Northumberland), Robert Spence, Esq.	124	Jan.	29·470	1·994	54·6	26·3	28·3	44·5	36·7	7·8	40·3	35·7	·209	2·5	0·4	84	546	—	34·7	1·9	5	2	9	15	—	6·1	21	1·02
		Feb.	30·026	1·935	45·9	17·7	28·2	40·9	31·9	9·0	35·9	33·2	·180	2·1	0·3	86	562	—	30·1	1·8	12	6	2	8	—	7·1	16	1·91
		Mar.	29·788	1·158	51·0	27·5	23·5	43·4	35·1	8·3	39·6	36·1	·219	2·6	0·4	88	552	—	33·8	1·7	7	11	9	4	—	7·3	24	1·86
MILTOWN (Banbridge, Ireland), John Smyth, Esq., jun., M.A., M.I.C.E.I.	200	Jan.	29·258	1·774	53·0	25·0	28·0	45·4	36·3	9·1	40·8	37·6	·225	2·6	0·4	87	541	53·7	32·1	2·4	2	5	20	4	5·4	6·0	24	3·96
		Feb.	29·927	1·935	49·0	13·0	36·0	41·8	30·3	11·5	35·6	32·2	·182	2·1	0·4	87	560	61·3	25·1	1·0	10	4	6	8	3·0	4·9	15	1·15
		Mar.	29·548	1·185	60·0	29·0	31·0	47·3	35·8	11·5	41·2	37·4	·224	2·6	0·5	87	547	78·3	30·8	2·0	9	10	7	5	4·6	5·5	21	2·31

Note.—*Erratum.* **Marlborough College.**—The reading of minimum radiation thermometer for 1872, October, should be 35°·9 instead of 25°·9; and the mean for the quarter 34°·9 instead of 31°·5. It is probable that the readings for some time past have been too low.

The Barometer Reading, York, January 22nd, 3h. p.m., 29·712 in., has been altered to 28·712 in.
" St. John's College, Battersea, " 19th, 9h. a.m., 29·858 in., " 28·858 in.
" Hull, " 21st, 5h. p.m., 28·004 in., " 29·004 in.
" Guildhall, " 7th, 3h. p.m., 29·100 in., " 30·100 in.

Second Rain-gauges are placed—

			January.	February.	March.	Total during the Quarter.
At Eastbourne,	at the height of 160 feet	*above the sea*, the amount collected was	3·39 inches.	— inches.	— inches.	inches.
" Beachy Head,	" 610 feet	" "	2·10 "	— "	— "	"
" Portsmouth,	" 20 feet	*above the ground* "	4·14 "	1·78 "	1·80 "	7·72 "
" Strathfield Turgiss,	" 38 feet	" "	1·58 "	1·11 "	1·47 "	4·16 "
" Eccles, Manchester,	" 34 feet	" "	2·80 "	0·35 "	2·14 "	5·29 "
" Allenheads,	" 6½ feet	" "	7·57 "	1·79 "	1·29 "	10·65 "
" Carlisle,	" 3 feet	" "	0·84 "	1·02 "	1·87 "	3·73 "
" Miltown, Ireland,	" 40 feet	" "	3·46 "	0·58 "	1·90 "	5·94 "
" Brighton,	" 35 feet	" "	— "	— "	— "	— "
" Radcliffe Observatory,	" 22 feet	" "	2·02 "	0·92 "	2·33 "	5·27 "
" Marlborough College,	" 8 inches	" "	4·24 "	1·40 "	2·58 "	8·22 "
" "	" 1 foot	" "	4·05 "	1·16 "	2·59 "	7·80 "
" Cardington,	" 36 feet	" "	1·84 "	1·24 "	1·14 "	4·22 "
" Nottingham,	" 25½ feet	" "	1·98 "	0·76 "	1·79 "	4·53 "
" Wisbech,	" 8 feet	" "	1·71 "	1·48 "	1·45 "	4·59 "
" Aldershot Camp,	" 25 feet	" "	3·19 "	1·75 "	1·85 "	6·79 "

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°							
Guernsey - - -	29·617	57·0	31·5	25·5	47·2	39·2	21·5	8·0	42·9	40·5	·253	2·9	0·3	91	547	—	—	1·5	7	8	8	7	—	6·2
Helston - - - -	29·735	63·0	30·0	33·0	50·9	41·4	27·0	9·5	45·8	38·3	·232	2·9	0·9	76	544	56·6	38·4	2·3	9	6	7	8	5·3	6·0
Truro - - - -	29·634	59·0	27·0	32·0	48·8	39·4	28·7	9·4	43·2	39·3	·243	2·8	0·5	87	550	—	—	2·8	9	7	6	8	—	7·8
Osborne - - -	29·651	63·5	26·4	36·9	46·4	36·8	27·0	10·1	40·7	38·1	·233	2·7	0·3	90	550	63·1	33·6	0·2	9	7	7	7	—	7·4
Bournemouth - -	—	59·1	27·0	32·1	45·8	37·1	23·6	8·7	40·9	36·2	·215	2·5	0·5	82	553	—	—	—	10	5	5	10	—	5·7
Portsmouth - -	29·673	61·6	19·6	42·0	47·1	32·4	30·9	14·7	39·9	37·3	·224	2·5	0·4	87	554	68·2	27·3	1·3	9	6	8	7	2·1	8·0
Worthing - - -	29·649	60·9	27·0	33·9	45·9	37·0	25·6	8·9	40·9	37·7	·228	2·6	0·3	88	552	72·9	33·4	1·0	9	6	7	8	4·7	7·1
Brighton - - -	29·651	61·4	26·6	34·8	44·7	36·6	26·0	8·1	40·3	37·1	·223	2·6	0·4	89	551	74·3	32·2	1·1	9	6	8	7	—	7·9
Lymington - - -	29·651	64·0	26·8	37·2	46·2	37·1	27·1	9·1	41·2	37·6	·228	2·6	0·4	87	551	—	34·9	1·3	8	8	6	8	—	7·1
Taunton - - -	29·641	65·0	14·2	50·8	47·1	34·1	37·6	13·0	40·7	38·3	·234	2·7	0·3	91	551	53·6	32·2	0·8	6	8	8	8	6·8	6·7
Wilton House - -	29·621	66·0	22·5	43·5	47·0	33·6	35·3	13·4	40·0	37·2	·224	2·6	0·3	90	550	72·3	32·2	1·4	9	8	8	5	5·6	7·6
Barnstaple - - -	29·631	67·0	28·5	38·5	47·9	38·2	27·7	9·7	42·7	38·4	·234	2·7	0·2	85	550	—	—	—	3	6	13	8	—	5·2
Aldershot Camp -	29·643	68·4	24·8	43·6	45·7	34·1	24·1	11·6	39·1	35·9	·215	2·5	0·4	89	548	66·7	30·0	1·5	7	7	8	8	2·2	7·9
Strathfield Turgiss -	29·680	67·2	24·0	43·2	45·1	34·5	27·6	10·6	39·6	35·6	·209	2·4	0·4	87	551	75·5	30·3	0·7	6	8	7	9	—	7·3
Weybridge Heath -	29·700	70·8	21·3	49·5	45·5	33·9	33·2	11·6	39·3	35·9	·212	2·5	0·4	88	553	64·9	32·3	0·9	7	7	11	5	1·3	7·3
Marlborough College	29·681	63·3	22·9	40·4	44·4	33·6	31·3	10·8	38·4	35·8	·212	2·5	0·3	90	547	67·0	30·9	—	6	10	8	7	4·3	7·8
Royal Observatory -	29·663	64·6	25·0	39·6	45·8	34·7	30·1	11·1	39·5	35·6	·210	2·4	0·4	86	551	66·6	29·9	0·6	7	8	7	8	—	7·3
Streatley Vicarage -	29·694	67·5	23·2	44·3	46·0	34·7	32·2	11·3	40·1	37·1	·222	2·3	0·4	89	551	51·8	—	1·5	5	8	9	8	—	7·7
St. John's Col. Battrsa.	29·621	65·0	20·0	45·0	46·4	32·3	34·0	14·1	39·3	36·0	·214	2·5	0·5	89	554	53·0	28·7	1·6	4	6	12	8	—	7·8
Camden Town - -	29·665	63·7	25·8	37·9	45·8	35·1	28·0	10·7	40·1	36·3	·216	2·5	0·4	85	551	58·5	32·8	—	11	5	5	9	—	7·4
Oxford - - - -	29·670	63·8	24·3	39·5	45·1	35·2	30·3	9·9	39·9	32·1	·209	2·5	0·5	85	550	76·1	32·9	1·3	7	6	10	7	2·4	8·3
Gloucester - - -	29·725	60·7	24·1	36·6	46·7	34·9	30·3	11·8	40·4	35·2	·207	2·4	0·5	82	553	66·4	33·9	0·8	7	6	8	9	1·6	7·1
Royston - - -	29·692	68·2	21·9	46·3	45·9	31·1	32·3	12·8	38·9	35·4	·209	2·4	0·4	87	550	—	—	—	7	5	9	8	—	7·3
Cardington - - -	29·684	63·0	23·0	40·0	45·2	33·7	31·3	11·5	38·9	35·3	·207	2·4	0·4	87	553	53·3	28·7	1·0	6	8	8	8	—	7·3
Lampeter - - -	29·669	66·0	17·0	49·0	48·0	32·1	35·8	15·9	39·9	34·9	·204	2·4	0·5	83	546	69·2	—	—	6	8	11	5	—	—
Somerleyton Rectory	29·645	62·3	24·4	37·9	45·0	34·1	30·5	10·9	39·4	37·5	·226	2·6	0·3	92	554	—	25·6	1·0	7	7	7	9	7·3	6·8
Norwich - - -	29·657	58·0	21·5	36·5	43·7	33·0	29·2	10·7	38·2	36·1	·214	2·5	0·2	93	555	—	—	—	7	7	7	9	—	—
Wisbech - - -	29·639	65·0	22·0	43·0	45·0	34·2	32·2	10·8	38·6	36·8	·221	2·6	0·2	93	555	68·7	31·1	0·6	7	7	8	7	3·5	7·4
Llandudno - - -	29·630	68·7	25·6	43·1	46·7	36·6	29·7	10·1	41·8	36·2	·214	2·5	0·5	80	550	—	—	0·7	4	7	6	13	—	7·1
Derby - - - -	29·642	61·0	22·0	39·0	44·4	34·1	31·0	10·3	38·8	35·3	·208	2·5	0·5	88	552	—	—	—	6	6	9	9	—	—
Hawarden - - -	29·627	60·0	25·0	35·0	43·6	35·5	26·2	8·1	38·8	35·9	·212	2·4	0·4	88	549	71·2	17·1	2·0	8	5	10	7	1·9	6·8
Liverpool - - -	29·639	62·4	24·1	38·3	45·1	35·4	28·3	9·7	39·8	35·2	·210	2·4	0·5	84	550	—	—	1·3	6	9	8	7	—	6·9
Eccles - - - -	29·649	65·5	14·6	50·9	45·7	33·4	33·9	12·3	39·5	34·8	·203	2·3	0·5	84	551	51·8	26·9	0·5	6	8	10	6	2·6	6·7
Hull - - - -	29·639	53·0	12·0	44·0	43·4	33·2	33·0	10·2	37·7	35·3	·207	2·4	0·3	92	556	57·4	30·9	—	—	—	—	—	3·3	—
Stonyhurst - - -	29·875	60·7	12·3	48·4	44·3	34·5	32·8	9·8	38·6	34·6	·200	2·3	0·4	86	548	76·1	29·4	—	6	8	7	9	—	7·6
Bradford - - -	29·613	58·0	22·8	35·2	44·8	34·7	27·6	10·1	39·3	35·9	·208	2·5	0·3	88	546	52·7	—	1·1	—	—	—	—	—	5·4
Leeds - - - -	29·650	62·0	15·0	47·0	44·8	32·6	33·3	12·2	39·0	33·6	·196	2·2	0·5	81	552	52·5	—	1·4	8	7	5	10	—	8·4
York - - - -	29·602	57·0	10·0	47·0	41·7	32·4	33·2	9·3	37·0	35·5	·209	2·4	0·2	94	555	—	—	—	—	—	—	—	—	—
Cockermouth - -	29·612	66·8	11·5	55·3	45·6	34·2	35·8	11·4	39·5	34·8	·203	2·4	0·5	83	551	64·0	26·5	0·6	5	9	9	7	2·4	5·6
Silloth - - - -	29·596	68·9	13·4	55·5	46·6	34·2	36·6	12·4	39·5	35·5	·210	2·4	0·4	87	553	69·3	29·7	—	3	12	5	9	7·0	6·8
Carlisle - - -	29·614	67·3	10·5	56·8	45·0	32·1	36·4	12·9	38·6	35·1	·206	2·3	0·4	88	552	61·7	27·4	1·5	6	7	9	8	5·9	6·9
Bywell - - - -	29·509	58·0	19·0	39·0	45·1	35·0	31·0	10·1	39·1	33·4	·192	2·2	0·6	80	549	49·7	28·6	1·2	4	9	6	12	—	6·4
North Shields - -	29·678	54·6	17·7	36·9	42·9	34·6	26·7	8·3	38·6	35·0	·203	2·4	0·4	86	553	—	32·9	1·8	8	6	7	9	—	6·8
Miltown (Ireland) -	29·589	60·0	13·0	47·0	44·8	34·1	31·7	10·7	39·2	35·7	·210	2·4	0·4	87	549	64·4	29·3	1·8	7	6	11	6	4·3	5·5

The highest temperatures of the air were at Weybridge Heath, 70°·8 Silloth, 68°·9; Llandudno, 68°·7; Aldershot Camp, 68°·4; 68°·2 and at Streatley Vicarage, 67°·5.

The lowest temperatures of the air were at York, 10°·0; Carlisle, 10°·5; Cockermouth, 11°·5; Hull, 12°·0; Stonyhurst, 12°·3; 13°·0; Silloth, 13°·4; Taunton, 14°·2 and at Eccles, 14°·6.

The greatest daily ranges of the temperatures of the air were at Lampeter, 15°·9; Portsmouth, 14°·7; St. John's College, B 14°·1; Carlisle, 12°·9; Eccles, 12°·3; and at Leeds, 12°·2.

The least daily ranges of the temperatures of the air were at Guernsey, 8°·0; Brighton and Hawarden, 8°·1 respectively; North 8°·3; Bournemouth, 8°·7; and at Worthing, 8°·9.

The greatest numbers of rainy days were at Stonyhurst, 69; North Shields, 61; Miltown, 60; Bywell, 59; Helston and 7 respectively; Guernsey, 57; and at Marlborough College, 55.

The least numbers of rainy days were at Carlisle, 36; Silloth, 37; Derby, 39; Royal Observatory, 41; and at Taunton, St College, Battersea, Lampeter, Norwich, Liverpool, and York, 42 respectively.

The heaviest falls of rain were at Helston, 14·45 inches Truro, 14·40 inches; Guernsey, 13·80 inches; Cockermouth, 12·2 Barnstaple, 11·49 inches; Bournemouth, 11·26 inches and at Wilton House, 10·73 inches.

The least falls of rain were at North Shields, 4·79 inches; Derby, 4·87 inches; Somerleyton Rectory, 5·04 inches; Carding inches; and at Wisbech, 5·13 inches.

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°							
Guernsey - - - -	29·617	57·0	31·5	25·5	47·2	39·2	21·5	8·0	42·9	40·5	·253	2·9	0·3	91	547	—	—	1·5	7	8	8	7	—	6·2
Between the latitudes 50° and 51° -	29·663	61·5	26·3	35·2	47·2	37·2	27·0	9·8	41·6	37·7	·228	2·7	0·3	86	551	67·0	33·0	1·4	9	6	7	8	4·0	7·1
51° and 52° -	29·659	66·0	23·0	43·0	46·0	34·5	30·9	11·5	39·9	36·2	·218	2·5	0·4	88	551	64·2	31·2	1·1	7	7	9	7	3·8	7·4
52° and 53° -	29·665	63·7	22·4	41·3	45·6	34·0	31·4	11·6	39·4	35·9	·212	2·5	0·4	87	552	64·4	29·8	0·8	6	7	8	9	4·1	7·1
53° and 54° -	29·639	60·2	17·0	43·2	44·2	34·0	31·0	10·2	38·7	35·1	·206	2·4	0·4	87	551	60·3	26·1	1·3	7	7	8	7	2·9	7·6
54° and 55° -	29·605	65·2	13·6	51·6	45·6	33·9	35·0	11·7	39·2	34·7	·203	2·4	0·4	84	551	61·2	28·1	0·8	4	9	8	9	5·1	6·4
North Shields - - -	29·678	54·6	17·7	36·9	42·9	34·6	26·7	8·3	38·6	35·0	·203	2·4	0·4	86	553	—	32·9	1·8	8	6	7	9	—	6·8
Miltown, Banbridge (Ireland) -	29·589	60·0	13·0	47·0	44·8	34·1	31·7	10·7	39·2	35·7	·210	2·4	0·4	87	549	64·4	29·3	1·8	7	6	11	6	4·3	5·5
Mean for the Quarter, 50° to 55° Year 1870	29·757	57·9	19·3	38·6	44·1	33·7	32·2	10·4	38·5	34·7	·202	2·4	0·4	86	554	63·8	29·1	1·1	8	7	7	8	4·6	6·8
" 1871	29·713	67·0	14·1	52·9	46·2	34·6	34·2	11·6	40·1	36·2	·216	2·5	0·4	86	551	66·4	28·1	1·2	5	6	9	10	—	6·6
" 1872	29·454	61·2	25·2	36·0	49·3	38·0	28·7	11·3	43·3	39·4	·243	2·8	0·5	87	544	39·6	22·6	1·0	4	5	13	8	4·5	6·5
" 1873	29·650	63·3	20·5	42·8	45·7	34·7	31·1	11·0	39·8	35·9	·213	2·5	0·4	86	551	63·4	29·3	1·1	7	7	8	8	4·0	7·0

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING JUNE 30, 1873.

REMARKS ON THE WEATHER DURING THE QUARTER ENDING JUNE 30TH, 1873.

By JAMES GLAISHER, ESQ., F.R.S., *&c.*

The warm weather which set in a week previous to the close of the preceding quarter continued to the 5th day of April, the mean excess of temperatures above their averages being 3¼° daily; from the 6th to the 13th, the weather was very cold, the wind was mostly N.E., and the depression of temperature below the average was 3½° daily; from the 14th to the 21st, the weather was warm, and particularly so on the 15th, 16th, and 17th days; the direction of the wind was for the most part from the East, and the average excess of mean temperature was 6°·9 daily. From the 22d day of April, a long cold period set in, and the weather continued with but very few trifling exceptions, continually below the seasonable average till the 18th day of June; for this long period of 57 days, the deficiency of mean temperature was on the average 2¾° daily. On the 19th of June a warmer period set in, but not uninterruptedly, for four out of the remaining 12 days were of lower temperature than was due to the season; upon this period of 12 days there was a mean excess of daily temperature of 1½°.

The average duration of the different directions of the wind in days, and the average duration of each direction in each month in the quarter, are as follows:—

Direction.	APRIL.			MAY.			JUNE.		
	Average.	1873.	Departure from Average.	Average.	1873.	Departure from Average.	Average.	1873.	Departure from Average.
	d.	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*
N.W.	2¼	3	+ ¾	1¾	4	+2¼	2	2	0
N.	4	5	+1	4¾	5	+ ¼	3½	3	− ½
N.E.	6	11	+5	7	6	−1	3½	4	+ ½
E.	3½	3	− ½	2½	2	− ½	2	1	−1
S.E.	2	2	0	1¾	1	− ¾	1¾	2	+ ¼
S.	2½	0	−2½	2¾	1	−1¾	2	2	0
S.W.	6½	3	−3½	7½	6	−1½	10	8	−2
W.	2½	3	+ ½	2	6	+4	3¼	7	+3¾
Calm, nearly.	1	0	−1	2	0	−2	1½	1	− ½

In which the numbers of + signs opposite to the compounds of the North winds, in the months of April and May, and the sign of − opposite to the South winds, indicate the preponderance of the former over, and of the deficiency of the latter below, their averages during these months. The departures in the month of June are small, excepting only that of the West wind, which prevailed for 3¼ days more than its average duration.

The mean temperature for the month of April at Greenwich was 4°·0 above that in March; that in May was 4°·7 above that in April; and that in June was 8°·3 above that in May. The average increase from March to April was 5°·6; from April to May was 5°·9; and that from May to June was 6°·0.

The average increase from all stations from March to April was 4°·0; from April to May was 4°·1; and from May to June was 7°·5.

1873. MONTHS.	Temperature of Air. Mean.	Air. Diff. from average of 102 years.	Air. Diff. from average of 32 years.	Evaporation. Mean.	Evaporation. Diff. from average of 32 years.	Dew Point. Mean.	Dew Point. Diff. from average of 32 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 32 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 32 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour. Diff. from average of 32 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
April -	45·9	−0·1	−1·2	42·7	−1·4	38·9	−1·8	19·5	+0·9	49·3	0·237	−0·017	2·8	−0·1
May -	50·6	−2·0	−2·4	47·3	−1·9	43·7	−1·8	19·8	−0·7	53·3	0·285	−0·018	3·3	−0·1
June -	58·9	+0·7	−0·1	55·3	−0·7	52·1	−1·4	19·2	−1·9	60·7	0·389	−0·018	4·3	−0·2
Means -	51·8	−0·5	−1·2	48·4	−1·3	44·9	−1·7	19·5	−0·6	54·4	0·304	−0·018	3·5	−0·1

1873. MONTHS.	Degree of Humidity. Mean.	Humidity. Diff. from average of 32 years.	Reading of Barometer. Mean.	Barometer. Diff. from average of 32 years.	Weight of a Cubic Foot of Air. Mean.	Weight. Diff. from average of 32 years.	Rain. Amount.	Rain. Diff. from average of 58 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
April -	78	− 1	29·832	+0·053	546	+3	0·6	−1·1	291	19	10	1	17·4	43·6
May -	78	+ 2	29·795	+0·014	540	−1	1·5	−0·6	270	6	19	6	23·3	48·1
June -	78	+ 4	29·794	−0·020	531	−1	2·6	+0·7	251	0	7	23	33·0	55·2
Means -	78	+ 2	29·804	+0·016	539	0	Sum 4·7	Sum −1·0	Mean 271	Sum 25	Sum 36	Sum 30	Lowest 17·4	Highest 55·2

NOTE.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the [illegible] above the average.

The readings of the barometer at 159 feet above sea level varied but very little during April, the mean daily values oscillating above and below the average in periods of three or four days, but in no case was the departure on either side in excess of 0·4 inch. The absolute range in the month was eight tenths of an inch nearly, the mean value for the month being 29·8 in. The range of reading in May was greater than in April, amounting to a little more than one inch, though the mean value was nearly the same. A general tendency to increase was shown as the month advanced, the minimum 29·2 in. occurring on the 5th, and the maximum, 30·2 in. on the 29th. Frequent movements were experienced in June, but only to small amounts. The principal changes were:—A general increase to 30·1 in. on the 7th, a decrease to 29·4 in. on the 12th, an increase to 30·1 in. on the 21st, and a decrease to 29·6 in. on the 30th, but these oscillations were broken by very frequent smaller movements. The mean value for June was 29·8 in., and the range of reading in the month was three quarters of an inch.

The mean temperature of April was 45°·9, being 0°·1 lower than the average of 102 years, and lower than in any year back to 1861, when 44°·3 was recorded, the average values for the intervening years being about 48°.

The mean temperature of May was 50°·6, being 2°·0 lower than the average of 102 years, 0°·3 lower than in 1872, but 0°·1 higher than in 1869.

The mean temperature of June was 58°·9, being 0°·7 higher than the average of 102 years 0°·3 lower than in 1872, but 4°·1 higher than in 1871.

The mean high day temperatures of each of the three months in the quarter were lower than their respective averages.

The mean low night temperatures of the three months were also lower than their respective averages.

Therefore the days and nights throughout the quarter were cold.

The daily ranges of temperature were less than their respective averages in May and June by 0°·7 and 1°·0, but greater in April by 0°·9.

The fall of rain was 1·1 in. and 0·6 in. respectively in defect in April and May, but 0°·7 in. in excess in June.

The mean temperature of the air in the three months ending May, constituting the three spring months, was 46°·1, being 0°·4 lower than the average of the preceding 102 years.

Thunderstorms occurred on the 6th of April at Royston, Halifax, Hull, and Allenheads; on the 15th at Llandudno, Liverpool, and Halifax; on the 16th at Eastbourne, Brighton, Marlborough, Oxford, Gloucester, Cardington, Lampeter, Wisbech, Llandudno, and Liverpool; and on the 17th at Lampeter. On the 3d of May at Royston, Norwich, Halifax, Hull, Stonyhurst, and York; on the 7th at Guernsey; on the 8th at York; on the 9th at Streatley and Oxford; on the 22d at Hull; on the 23d at Somerleyton, Llandudno, and Hull; on the 26th at Oxford; and on the 27th at Brighton, Barnstaple, Royston, Cardington, and Stonyhurst. On the 3d of June at Gloucester, Cardington, Llandudno, Hawarden, Liverpool, Eccles, Halifax, and Stonyhurst; on the 4th at London; on the 5th at Salisbury; on the 11th at Eccles; on the 13th at Salisbury and Marlborough College; on the 14th at Norwich; on the 17th at Guernsey; on the 18th at Eccles; and on the 29th at Oxford, Gloucester, Eccles, and Stonyhurst.

Thunder was heard, but lightning was not seen, on the 1st of April at Allenheads; on the 5th at Bywell; on the 6th at Osborne, Brighton, Weybridge, Streatley, Wisbech, and Cockermouth; on the 15th at Strathfield Turgiss and Royston; on the 16th at Strathfield Turgiss, Weybridge, London, Royston, and Hawarden; on the 17th at Hawarden; and on the 26th at Brighton. On the 2d of May at Bywell; on the 3d at Wisbech, Eccles, and Halifax; on the 6th at Eccles; on the 7th at Helston; on the 8th at Hull, Stonyhurst, Cockermouth, Carlisle, and Bywell; on the 12th at Hull; on the 20th at Bywell; on the 23d at Wisbech; on the 26th at Cardington; on the 27th at Weybridge, Streatley, and London; on the 28th at Stonyhurst; and on the 29th at Bywell. On the 3d of June at Oxford; on the 4th at Brighton, Weybridge, and Carlisle; on the 8th at North Shields; on the 12th at Llandudno, Hawarden, Liverpool, and Bywell; on the 13th at Lymington, Strathfield Turgiss, Weybridge, Streatley, Oxford, Cardington, Somerleyton, Liverpool, and Stonyhurst; on the 14th at Somerleyton and Bywell; on the 15th at Bywell; on the 17th at Stonyhurst; on the 18th at Oxford, Stonyhurst, and Bywell; and on the 29th at Brighton, Weybridge, Streatley, Somerleyton, and Liverpool.

Lightning was seen, but thunder was not heard, on the 15th of April at Brighton, Weybridge, London, Oxford, Royston, Cardington, Llandudno, Halifax, and Stonyhurst; and on the 16th at Guernsey, Osborne, Streatley, London, Royston, Stonyhurst, and Carlisle. On the 2d of June at Truro; on the 3d at Carlisle; and on the 29th at Guernsey.

Solar halos were seen on the 5th of April at Oxford; on the 13th at Halifax; on the 14th at Halifax; on the 15th at Portsmouth and Oxford; on the 17th at Strathfield Turgiss, Oxford, and Halifax; on the 18th at Wisbech; on the 21st at Brighton and Strathfield Turgiss; on the 23d at Oxford; and on the 26th at Liverpool and Halifax. On the 10th of May at North Shields; on the 17th at Brighton; on the 20th at Wisbech; on the 24th at Leeds; and on the 25th at Brighton. On the 14th of June at Strathfield Turgiss; on the 15th at Brighton; and on the 28th at Brighton.

Lunar halos were seen on the 2d of April at Oxford; on the 3d at Wisbech, Eccles, Halifax, Hull, Stonyhurst, and Cockermouth; on the 4th at Sidmouth and Cockermouth; on the 5th at Portsmouth, Brighton, Weybridge, London, Oxford, Wisbech, Halifax, and Stonyhurst; on the 6th at Brighton and Oxford; on the 9th at Eccles; on the 13th at Brighton; and on the 15th at Eccles. On the 4th of May at Stonyhurst. On the 9th of June at Brighton and Weybridge.

Auroræ Boreales were seen on the 1st of April at Portsmouth, Brighton, Oxford, Wisbech, and Stonyhurst; on the 2d at Guernsey and Oxford; on the 18th at Eccles, Halifax, Hull, Stonyhurst, York, Cockermouth, and Silloth; on the 19th at Oxford, Halifax, Hull, and Stonyhurst; on the 20th at Oxford and Stonyhurst; on the 21st at Norwich; on the 24th at Brighton; on the 28th at Brighton; and on the 30th at Guernsey and Brighton. On the 15th of May at Brighton. On the 25th of June at Stonyhurst.

and Allenheads; on the 23d at Brighton, Strathfield Turgiss, Weybridge, Marlborough College, Streatley, London, Oxford, Royston, Somerleyton, Norwich, Wisbech, Halifax, Hull, Leeds, York, Allenheads, and Bywell; on the 24th at Eastbourne, Brighton, Lymington, Weybridge, Streatley, Oxford, Royston, Somerleyton, Eccles, Halifax, Stonyhurst, Leeds, York, Cockermouth, and Bywell; on the 25th at Guernsey, Eastbourne, Brighton, Weybridge, Streatley, London, Gloucester, Royston, Somerleyton, Norwich, Llandudno, Hawarden, Eccles, Halifax, Hull, Stonyhurst, Leeds, York, Cockermouth, Allenheads, and Bywell; on the 26th at Eastbourne, Royston, Halifax, and Hull; on the 27th at Weybridge, Somerleyton, and Allenheads; and on the 29th and 30th at Allenheads. On the 3d, 4th, 5th, 6th, 15th, 16th, and 17th of May at Allenheads; on the 18th at Halifax, Stonyhurst, and Allenheads; on the 19th, 20th, and 21st at Allenheads.

Hail fell, on 12 days in April; on 10 days in May; and on 2 days in June.

Fog prevailed, at different places on 27 days during the quarter.

Leaf buds first appeared on, the Horsechestnut on the 1st of April; the Lime and Sycamore on the 9th at Strathfield Turgiss; the Common poplar on the 10th; the Hawthorn on the 12th; the Horsechestnut and Occidental plane on the 16th; the Wych Elm and Sycamore on the 23d; the Field Elm on the 25th; the Walnut on the 10th of May; the Oak on the 17th of May; the Oriental plane on the 20th of May at Hull; the Common poplar and the Beech on the 5th of May; the Walnut on the 10th of May at Carlisle; the Horsechestnut on the 14th of April at Lampeter; the Occidental plane on the 18th of April at Brighton; and on the Walnut on the 10th of April at Weybridge.

In leaf,	Field elm,	the earliest,	April 15, at Oxford;	the latest,	May 24, at Hull.
,,	Wych elm,	,,	April 14, at Oxford;	,,	May 24, at Hull.
,,	Oak,	,,	April 14, at Helston;	,,	June 12, at Hull.
,,	Lime,	,,	April 17, at Oxford;	,,	May 29, at Hull.
,,	Sycamore,	,,	April 13, at Brighton;	,,	May 27, at Hull.
,,	Horsechestnut,	,,	April 6, at Oxford;	,,	May 15, at Brighton.
,,	Common poplar,	,,	April 17, at Oxford;	,,	June 12, at Hull.
,,	Oriental plane,	,,	May 15, at Brighton;	,,	June 18, at Hull.
,,	Hawthorn,	,,	April 10, at Oxford & Miltown;	,,	May 23, at Hull.
,,	Hazel,	,,	April 14, at Oxford;	,,	May 24, at Hull.
,,	Walnut,	,,	April 16, at Oxford;	,,	June 20, at Hull.
In blossom,	Hardy apple,	,,	April 18, at Helston;	,,	May 20, at Miltown.
,,	Hardy pear,	,,	April 8, at Oxford;	,,	May 2, at Stonyhurst.
,,	Cherry,	,,	April 4, at Strathfield Turgiss;	,,	April 30, at Hull.
,,	Peach,	,,	April 10, at Miltown;	,,	May 2, at Carlisle.
,,	Plum,	,,	April 14, at Wisbech;	,,	May 5, at Stonyhurst.
,,	Lilac,	,,	April 22, at Helston;	,,	May 30, at Carlisle.
,,	Laburnum,	,,	April 21, at Helston;	,,	June 5, at Hull.
,,	Yellow broom,	,,	April 14, at Weybridge;	,,	June 4, at Brighton.
,,	White broom,	,,	May 7, at Weybridge;	,,	May 20, at Miltown.
,,	Privet,	,,	June 10, at Strathfield Turgiss;	,,	June 29, at Oxford.
,,	Mountain ash,	,,	May 6, at Strathfield Turgiss;	,,	June 8, at Weybridge.
,,	Syringa,	,,	May 8, at Wisbech;	,,	May 31, at Strathfld. Turgiss.
,,	Honeysuckle,	,,	May 19, at Llandudno;	,,	June 28, at Hull.
,,	Acacia,	,,	June 18, at Weybridge;	,,	June 22, at Oxford.

Wheat in ear, on the 12th of June at Strathfield Turgiss and Cardington; on the 17th at Brighton; on the 21st at Hawarden and Cockermouth; on the 24th at Silloth. *In flower*, on the 20th of June at Weybridge; on the 26th at Oxford and Cardington.

Barley in ear, on the 15th of June at Cardington; on the 26th at Cockermouth. *In flower*, on the 29th of June at Cardington.

Oats in ear, on the 25th of June at Cockermouth.

Flax above ground, on the 8th of May at Miltown, and *in flower*, on the 25th of June.

Cuckoo arrived, on the 10th of April at Silloth; on the 13th at Brighton and Strathfield Turgiss; on the 14th at Eastbourne; on the 15th at Guernsey, Truro, Weybridge, and Royston; on the 16th at Salisbury; on the 17th at Hawarden; on the 20th at Wisbech; on the 26th at Miltown; on the 28th at Cardington; on the 29th at Llandudno; on the 30th at Oxford. On the 1st of May at Lampeter; on the 2d at Hull; on the 3d at Stonyhurst; on the 9th at Carlisle.

Swallow arrived, on the 4th of April at Osborne; on the 5th at Helston; on the 8th at Salisbury; on the 13th at Truro; on the 14th at Strathfield Turgiss; on the 15th at Royston, Cardington, Hawarden, and Miltown; on the 16th at Hull; on the 18th at Weybridge; on the 20th at Wisbech and Silloth; on the 21st at Oxford and Stonyhurst; on the 29th at Brighton. On the 1st of May at Llandudno; on the 3d at Carlisle.

Nightingale arrived, on the 7th of April at Strathfield Turgiss; on the 14th at Eastbourne; on the 15th at Weybridge and Royston; on the 17th at Cardington. *Departed*, on the 10th of June from Weybridge.

It is generally remarked all over the country, in respect to the very small number of insects this season, and J. Jenner Weir, Esq., President of the Blackheath Natural History Society, in a letter, says:—"In accordance with your wish I give a short note on the condition of lepidopterous "life this year. I have been into Southern Kent and Sussex and never before in my experience "found so few day flying lepidoptera.

"The South Downs, which in the month of June generally swarm with blue butterflies of the "genus Lycæna, are this year almost without them, certainly, where hundreds usually occur only "units can be found.

"*The day flying moths and Sphingidæ are equally rare.*

"*Another curious fact is*, that all that I found were late in their appearance, by this I mean that "*many insects* were common as late as the last day in June.

"*I consider the wet winter* destroyed the ova, pupæ, and larvæ of the different species."

B 2

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING JUNE 30TH, 1873.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S.	204	April	29·806	0·778	62·0	33·5	28·5	52·4	42·4	10·0	46·6	40·6	·253	2·9	0·5	81	545	–	–	1·4	10	7	5	8	–	5·2	11	0·47
		May	29·781	0·927	61·5	42·5	19·0	57·0	47·0	10·0	51·3	45·8	·309	3·5	0·6	82	540	–	–	1·2	9	6	8	8	–	3·9	10	1·65
		June	29·777	0·860	69·0	48·5	20·5	63·0	51·3	11·7	56·2	52·9	·402	4·6	0·7	80	534	–	–	1·2	8	4	7	11	–	5·4	11	1·62
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	106	April	30·046	0·866	72·0	29·0	43·0	58·5	41·9	16·6	49·1	40·3	·250	3·1	1·3	71	550	83·2	37·6	2·4	13	7	3	7	3·9	4·0	12	0·73
		May	30·016	1·041	76·0	32·0	44·0	63·2	44·9	18·3	52·9	44·3	·292	3·5	1·4	71	535	88·9	41·9	2·4	8	7	4	12	4·0	4·8	10	2·01
		June	29·955	0·895	74·0	42·0	32·0	68·5	51·2	17·3	58·6	50·6	·370	4·2	1·4	75	535	100·1	49·2	2·4	8	3	7	12	3·9	5·5	11	1·83
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	April	30·023	0·853	68·0	27·0	41·0	55·9	41·1	14·8	46·7	40·3	·251	2·9	0·8	80	549	–	–	2·8	14	9	2	5	–	5·8	–	–
		May	29·981	1·005	69·0	32·0	37·0	60·0	46·0	14·0	51·4	43·9	·288	3·2	1·0	76	543	–	–	2·9	12	8	0	11	–	5·4	9	1·49
		June	29·989	0·832	72·0	42·0	30·0	66·2	52·9	13·8	56·8	52·8	·400	4·6	0·8	86	537	–	–	2·4	10	2	6	12	–	6·9	11	1·38
SIDMOUTH (Devon), J. Ingleby Mackenzie, Esq., M.B., F.M.S.	30	Mar.	29·765	1·065	56·6	28·3	28·3	48·6	37·6	11·0	43·1	40·7	·254	2·9	0·3	91	548	–	–	0·8	7	9	9	6	–	3·2	16	3·68
		April	30·006	0·798	61·8	31·0	30·8	53·8	40·4	13·4	46·1	42·9	·279	3·2	0·2	89	549	–	–	1·5	11	10	4	5	–	3·0	8	0·58
		May	29·971	1·066	65·0	35·5	29·5	59·2	45·3	13·9	50·9	48·1	·334	2·7	1·0	78	543	–	–	1·2	9	6	10	6	–	3·3	9	1·25
		June	29·991	0·820	69·0	43·8	25·2	64·8	51·9	12·9	57·0	55·0	·431	4·7	0·4	92	537	–	–	1·0	10	3	8	9	–	5·9	9	0·89
EASTBOURNE (Sussex), Miss W. L. Hall.	12	Feb.	30·048	1·782	49·8	27·0	22·8	41·5	32·2	9·3	36·8	33·3	·191	2·2	0·4	88	561	56·6	26·3	0·4	14	8	2	4	1·0	–	13	2·69
		Mar.	29·803	0·947	64·4	28·2	36·2	51·2	37·5	13·7	43·5	32·5	·184	2·1	1·1	65	549	88·6	29·9	0·5	3	12	11	5	3·2	–	19	2·83
		April	29·990	0·784	66·8	28·2	38·6	57·1	39·4	17·7	47·2	39·5	·243	2·8	0·9	75	548	102·3	31·9	0·5	10	10	3	7	3·5	–	12	0·73
		May	29·980	0·922	70·2	34·4	35·8	62·1	44·4	17·7	51·5	43·9	·287	3·2	1·1	76	533	109·2	37·6	0·6	7	7	7	10	5·3	–	13	1·62
OSBORNE (Isle of Wight), J. R. Mann, Esq.	172	April	29·830	0·890	66·1	33·1	33·0	56·3	40·7	15·6	47·0	40·8	·255	3·0	0·8	80	546	95·3	34·6	–	12	7	3	8	–	6·0	9	1·25
		May	29·809	0·984	72·2	34·8	37·4	62·5	44·9	17·6	51·8	46·2	·314	3·5	0·8	81	539	101·3	36·7	–	7	5	9	10	–	5·7	13	1·00
		June	29·802	0·762	75·7	44·8	30·9	68·4	51·9	16·5	57·7	54·2	·421	4·4	0·6	88	532	103·2	43·4	–	8	3	7	12	–	7·1	12	1·54
PORTSMOUTH, William O. Ellis, Esq., F.M.S.	16	April	30·005	0·783	67·4	26·2	41·2	57·0	35·1	21·9	45·0	36·0	·211	2·5	0·9	71	551	100·2	30·2	1·5	12	11	3	4	2·6	6·7	9	0·73
		May	29·972	1·001	71·2	32·0	39·2	62·1	39·9	22·2	50·0	41·8	·265	3·0	1·1	74	545	112·6	32·6	1·5	3	5	10	13	3·3	5·2	13	0·97
		June	29·958	0·777	78·0	40·4	37·6	70·9	47·5	23·4	57·0	52·4	·397	4·4	0·8	85	536	–	–	1·5	4	6	7	11	2·3	6·2	–	–
BRIGHTON (Sussex), Frederick E. Sawyer, Esq., F.M.S.	200	April	29·774	0·797	68·9	28·0	40·9	53·6	39·9	13·7	45·8	38·0	·223	2·7	0·8	75	546	104·1	35·8	1·1	12	8	3	7	–	7·1	14	0·73
		May	29·769	1·036	66·5	35·4	31·1	59·2	44·4	14·8	50·6	43·4	·282	3·3	0·9	77	540	110·8	39·8	0·8	6	5	7	13	–	6·5	14	0·87
		June	29·766	0·797	77·2	43·0	34·2	67·5	52·1	15·4	59·0	54·2	·421	4·8	0·8	85	531	112·6	48·7	0·7	3	3	12	12	–	8·1	12	1·99
LYMINGTON (Hants), George J. Jones, Esq.	77	April	29·930	0·750	72·0	25·8	46·2	56·6	39·0	17·6	47·5	38·6	·234	2·7	1·0	72	547	–	35·3	1·7	11	9	3	7	–	5·8	7	0·85
		May	29·912	0·889	70·0	32·4	37·6	60·8	43·1	17·7	50·8	42·2	·270	3·1	1·1	74	543	–	38·9	1·6	7	6	8	10	–	5·7	11	1·14
		June	29·894	0·755	73·0	41·8	31·2	66·0	50·1	15·9	57·0	52·6	·397	4·3	0·8	85	535	–	44·9	1·6	8	5	8	9	–	6·5	11	1·78
TAUNTON (Somerset), Rev. W. Tuckwell, F.M.S.	80	June	29·888	0·747	79·1	41·0	38·1	69·2	50·4	18·8	57·7	51·6	·383	4·3	0·9	80	534	82·9	49·4	0·2	9	6	5	10	4·7	7·9	12	1·49
WILTON HOUSE (near Salisbury), T. Challis, Esq.	186	April	29·803	0·797	74·5	26·0	48·5	58·4	35·5	22·9	45·9	37·9	·228	2·8	0·6	74	546	101·4	32·6	1·2	12	11	4	3	4·5	6·4	6	1·01
		May	29·763	1·024	73·5	27·5	46·0	65·3	40·0	25·3	51·2	44·3	·292	3·3	0·8	78	539	110·1	36·7	1·2	11	6	4	10	4·8	6·0	11	1·35
		June	29·748	0·737	81·0	39·0	42·0	71·5	47·2	24·3	57·8	53·8	·410	4·6	0·6	86	531	111·4	45·4	1·3	9	4	6	11	4·5	7·4	10	2·45
BARNSTAPLE (Devon), T. Mackrell, Esq.	43	April	29·998	0·829	66·0	31·5	34·5	57·0	41·9	15·1	48·2	41·7	·262	3·0	0·8	79	547	–	–	1·2	10	8	5	7	–	3·7	10	1·11
		May	29·978	1·063	72·0	37·5	34·5	61·9	46·1	15·8	52·9	47·0	·327	3·6	0·9	81	541	–	–	1·3	4	4	11	12	–	3·5	11	2·30
		June	29·941	0·801	73·0	44·0	29·0	68·1	52·9	15·2	58·7	52·4	·395	4·4	1·0	80	534	–	–	1·3	8	3	11	13	–	5·3	11	1·50
ALDERSHOT CAMP (Hants), John Arnold, Esq., M.S.C., F.M.S.	325	April	29·634	0·681	77·4	25·6	51·8	57·0	37·1	19·9	45·3	38·2	·231	2·7	0·8	76	544	98·8	33·4	1·8	12	6	4	8	2·8	6·6	10	0·55
		May	29·608	0·935	75·0	32·0	43·0	64·3	40·8	23·5	49·6	40·5	·253	2·7	1·2	75	538	115·2	37·2	1·6	9	6	5	11	2·3	6·3	12	1·24
		June	29·598	0·744	79·6	42·0	37·6	70·3	50·2	20·1	57·6	50·8	·371	4·1	1·1	78	529	119·1	46·9	1·5	6	8	9	12	2·5	7·7	10	1·61

Names of Stations and Observers.	Height of Station above Sea Level.	Months.	Month. Mean.	Month. Range.	Highest.	Lowest.	Range.	Mean. Of all Highest.	Mean. Of all Lowest.	Mean. Daily Range.	Air.	Dew Point.	Elastic Force.	In a Cubic foot of Air. Mean.	In a Cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Satn.=1	Mean Weight of cubic foot of Air.	Maximum in Rays of Sun.	Minimum on Grass.	Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Number of Days it fell.	Amount collected.
	feet		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
STRATHFIELD TURGISS (Hants), Rev. C. H. Griffith, M.A., F.M.S.	197	April	29·798	0·780	74·3	27·9	46·4	56·5	37·9	18·6	46·1	37·5	·225	2·6	1·0	73	546	108·9	30·9	0·7	12	9	3	6	3·7	6·0	7	0·39
		May	29·769	1·010	69·9	29·0	40·9	60·8	41·6	19·2	50·3	41·5	·262	3·0	1·1	73	544	119·3	34·6	0·7	11	5	5	10	4·5	4·9	16	1·80
		June	29·771	0·757	77·4	40·8	36·6	68·4	49·5	18·9	57·3	50·6	·369	4·1	1·1	78	533	123·8	44·2	0·6	5	7	5	13	5·5	6·7	11	1·89
WEYBRIDGE HEATH (Surrey), William F. Harrison, Esq., F.M.S.	150	April	29·873	0·764	79·5	25·0	54·5	57·1	36·9	20·2	45·9	38·3	·233	2·7	0·4	75	547	94·4	34·5	1·6	15	8	3	4	1·6	6·0	12	0·66
		May	29·843	1·034	76·0	30·5	45·5	62·6	40·4	22·2	50·2	43·8	·286	3·3	0·8	82	542	104·5	37·2	0·8	10	6	7	8	1·5	5·5	15	1·58
		June	29·840	0·744	83·0	40·0	43·0	71·1	49·4	21·7	58·6	51·9	·387	4·3	1·2	79	532	111·0	45·8	0·8	7	8	8	7	0·7	6·0	13	1·54
MARLBOROUGH COLLEGE (Wilts), Rev. Thomas A. Preston, M.A.	456	April	29·541	0·766	73·3	28·7	44·6	54·0	36·8	17·2	44·0	37·1	·221	2·6	0·7	76	543	109·5	31·7	—	13	8	4	5	6·0	7·1	13	1·25
		May	29·503	1·029	67·0	26·7	40·3	58·8	40·1	18·7	48·1	41·6	·262	3·0	0·8	78	538	123·7	36·4	—	8	8	4	11	5·5	6·5	14	1·89
		June	29·504	0·763	75·0	39·4	35·6	64·9	49·2	15·7	55·2	49·5	·352	4·0	0·9	82	530	133·0	44·0	—	8	5	7	10	5·5	8·9	11	1·63
ROYAL OBSERVATORY (Kent), The Astronomer Royal.	159	April	29·822	0·798	76·8	28·7	48·1	57·4	37·9	19·5	45·9	38·9	·237	2·8	0·8	78	546	104·4	30·2	0·3	12	9	3	6	—	6·5	12	0·61
		May	29·795	1·027	70·9	34·0	36·9	62·3	42·5	19·8	50·6	43·7	·285	3·3	0·9	78	540	115·9	34·4	0·3	10	5	5	11	—	7·0	12	1·49
		June	29·724	0·745	81·2	42·0	39·2	70·2	51·0	19·2	58·9	52·1	·389	4·3	1·3	78	531	125·0	44·4	0·2	6	5	7	12	—	7·2	11	2·56
THE GUILDHALL (London), William Haywood, Esq.		Mar.	—	—	60·0	33·4	26·6	49·4	38·9	10·5	43·2	38·4	·232	2·7	0·5	83	—	—	—	—	-	-	-	-	—	—	—	1·45
		April	—	—	68·0	34·0	34·0	55·5	42·0	13·5	47·6	38·3	·236	2·7	1·0	72	—	—	—	—	-	-	-	-	—	—	—	0·75
		May	—	—	67·0	40·8	26·2	59·9	46·8	13·1	52·2	42·3	·270	3·1	1·4	70	—	—	—	—	-	-	-	-	—	—	—	1·56
		June	—	—	75·6	46·5	29·1	67·6	55·2	12·4	58·0	49·1	·349	3·9	1·4	73	—	—	—	—	-	-	-	-	—	—	—	2·54
STREATLEY VICARAGE (Berks), Rev. J. Slatter, M.A., F.R.A.S.	150	April	29·894	0·782	75·5	26·8	48·7	57·2	38·3	18·9	46·9	38·0	·230	2·7	1·0	72	547	68·1	—	1·5	13	9	2	6	—	6·4	13	0·44
		May	29·875	0·813	71·8	29·0	42·8	64·6	40·5	24·1	51·8	45·2	·302	3·4	0·9	78	541	75·2	—	1·9	14	4	2	11	—	5·5	10	1·75
		June	29·853	0·687	83·2	39·6	43·6	69·7	48·0	21·7	58·9	51·7	·385	4·5	1·0	77	532	86·5	—	1·7	9	5	6	10	—	6·5	13	2·19
ST. JOHN'S COLLEGE, BATTERSEA, Rev. J. P. Faunthorpe, M.A., F.R.G.S.	13	April	29·950	0·823	76·0	26·0	50·0	57·2	36·7	20·5	45·6	40·8	·257	2·9	0·6	84	549	75·5	30·1	1·9	5	9	9	7	—	6·3	12	0·59
		May	29·932	0·993	68·0	31·0	37·0	60·5	40·4	20·1	49·4	43·6	·285	3·2	0·8	81	544	84·4	33·2	1·6	3	4	14	10	—	6·2	11	1·44
		June	29·929	0·680	79·0	43·0	36·0	69·0	48·7	20·3	—	—	—	—	—	—	—	95·3	43·0	1·5	3	3	13	11	—	7·6	10	2·28
CAMDEN TOWN (London), G. J. Symons, Esq., F.M.S.	123	April	29·867	0·813	75·5	29·9	45·6	57·7	38·8	18·9	46·8	38·5	·233	2·8	0·9	75	546	96·6	34·6	—	16	5	2	7	—	5·7	11	0·55
		May	29·839	1·071	72·9	32·9	40·0	63·1	43·2	19·9	52·5	43·0	·278	3·2	1·3	71	539	105·7	39·9	—	14	3	5	9	—	6·4	14	1·56
		June	29·842	0·713	79·2	42·3	36·9	70·7	51·1	19·6	59·2	51·2	·378	4·3	1·4	75	532	111·1	48·7	—	11	5	4	10	—	6·5	11	2·24
CHISWICK (London), Thiselton Dyer, Esq.	25	April	29·972	0·798	76·5	27·5	49·0	57·0	37·8	19·2	45·8	39·1	·241	2·8	0·8	78	549	101·0	33·6	—	14	7	3	6	—	—	10	0·70
		May	29·946	0·990	75·0	28·0	47·0	62·4	41·4	21·0	50·3	48·1	·337	3·8	0·3	92	543	122·1	37·4	—	8	6	6	11	—	—	11	1·33
		June	29·932	0·756	81·0	37·5	43·5	69·6	49·1	20·5	57·4	51·5	·381	4·3	0·8	81	535	131·0	45·3	—	7	4	8	11	—	—	11	2·26
OXFORD (Oxfordshire), Rev. R. Main, M.A., F.R.S., F.R.A.S.	210	April	29·798	0·792	70·7	30·1	40·6	55·0	39·2	15·8	46·6	38·3	·232	2·7	1·0	74	545	104·3	35·2	1·2	13	6	3	8	3·7	7·5	13	0·48
		May	29·746	1·051	67·5	30·4	37·1	60·9	41·8	19·1	51·1	42·5	·273	3·1	1·1	73	539	114·6	34·4	1·0	8	5	6	12	3·8	7·0	15	2·31
		June	29·745	0·726	79·6	41·0	38·6	68·0	49·3	18·7	58·5	51·5	·381	4·2	1·3	77	531	113·8	—	1·0	6	5	10	9	3·4	8·1	15	2·90
GLOUCESTER (Gloucester), E. Toller, Esq., M.D.	100	April	29·969	0·948	72·6	30·9	41·7	58·3	39·2	19·1	47·2	37·6	·226	2·6	1·1	70	547	92·7	37·7	0·8	11	10	3	6	1·1	6·0	8	0·86
		May	29·912	1·134	73·1	32·2	40·9	64·4	44·2	20·2	52·5	41·5	·261	2·9	1·5	67	541	105·8	41·0	0·6	9	5	5	12	1·0	5·3	13	2·55
		June	29·925	0·713	76·1	38·6	37·5	70·4	51·1	19·3	58·5	51·5	·382	4·3	1·2	78	534	105·7	49·1	0·6	7	6	1	16	2·1	6·7	11	2·20
ROYSTON (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	April	29·734	0·774	76·0	27·1	48·9	58·4	36·2	22·2	45·2	39·2	·239	2·8	0·7	80	546	—	—	—	16	4	4	6	—	6·2	10	0·74
		May	29·689	1·039	70·6	31·5	39·1	62·2	40·3	21·9	49·3	43·3	·282	3·2	0·8	80	540	—	—	—	13	3	5	10	—	6·2	15	1·70
		June	29·706	0·701	85·0	39·8	45·2	72·5	48·5	24·0	58·1	52·4	·395	4·4	1·0	81	531	—	—	—	6	4	8	12	—	7·0	9	1·10
CARDINGTON (near Bedford), Mr. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	100	April	29·916	0·803	74·4	28·0	46·4	56·4	37·7	18·7	45·6	40·2	·250	2·9	0·7	82	549	86·0	30·8	0·9	14	8	3	5	—	5·8	9	1·20
		May	29·861	0·938	69·0	29·0	40·0	61·7	41·0	20·7	50·2	45·5	·305	3·5	0·7	84	542	98·0	34·3	0·7	9	5	2	15	—	5·1	14	2·00
		June	29·860	0·831	82·0	41·0	41·0	70·4	49·9	20·5	59·6	53·9	·417	4·7	1·1	83	532	106·2	43·4	0·7	6	6	6	12	—	6·6	10	2·35
ST. DAVID'S COLLEGE, LAMPETER (Cardiganshire), Prof. A. W. Scott.	420	April	29·614	0·813	72·0	23·0	—	57·9	35·4	22·5	45·8	39·6	·241	2·8	0·8	79	543	103·6	—	—	12	8	3	7	—	—	9	1·01
		May	29·547	1·067	75·0	28·0	47·0	62·4	39·1	23·3	50·6	44·0	·290	3·4	0·7	78	536	107·3	—	—	9	1	8	8	—	—	12	2·20
		June	29·520	0·800	78·0	36·5	41·5	68·4	51·8	16·6	58·2	52·1	·390	4·4	1·1	80	527	121·1	—	—	-	-	-	-	—	—	8	0·63
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	April	29·920	0·861	64·0	29·2	34·8	53·5	37·6	15·9	44·0	40·9	·257	2·9	0·4	89	550	—	28·3	1·1	12	10	3	5	7·1	5·1	15	0·90
		May	29·896	0·888	69·0	33·9	35·1	52·9	41·2	11·7	47·6	43·2	·280	3·3	0·6	86	546	—	32·2	1·1	10	7	5	9	7·7	6·4	12	1·77
		June	29·898	0·725	78·8	42·1	36·7	68·3	50·3	18·0	57·9	54·7	·427	4·7	0·7	89	534	—	41·2	1·0	5	7	10	8	6·7	5·0	8	1·00
NORWICH (Norfolk), C. M. Gibson, Esq., F.M.S.	41	April	29·940	0·846	63·5	28·0	35·5	52·1	36·8	15·3	43·5	39·4	·241	2·8	0·5	85	551	—	—	—	13	6	3	8	—	—	14	1·00
		May	29·895	0·978	67·0	35·0	32·0	57·5	41·0	16·5	48·0	44·2	·290	3·3	0·5	87	545	—	—	—	10	5	5	11	—	—	13	1·30
		June	29·900	0·685	78·5	42·0	36·5	68·6	50·0	18·6	57·9	52·6	·397	4·4	0·9	81	534	—	—	—	4	7	8	11	—	—	8	1·91

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING JUNE 30TH, 1873.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

NAMES of STATIONS and OBSERVERS.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat.ⁿ = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, SAMUEL ELLIOTT HOSKINS, ESQ., M.D., F.R.S.	204	April	29·806	0·778	62·0	33·5	28·5	52·4	42·4	10·0	46·6	40·6	·253	2·9	0·5	81	545	—	—	1·4	10	7	5	8	—	5·2	11	0·47
		May	29·781	0·927	61·5	42·5	19·0	57·0	47·0	10·0	51·3	45·8	·309	3·5	0·6	82	540	—	—	1·2	9	6	8	8	—	3·9	10	1·65
		June	29·777	0·860	69·0	48·5	20·5	63·0	51·8	11·7	56·2	52·9	·402	4·6	0·7	89	534	—	—	1·2	8	4	7	11	—	5·4	11	1·62
HELSTON (Cornwall), MATTHEW P. MOYLE, ESQ., M.R.C.S.	106	April	30·046	0·866	72·0	29·0	43·0	58·5	41·9	16·6	49·1	40·3	·250	3·1	1·3	71	550	83·2	37·6	2·4	13	7	3	7	3·9	4·0	12	0·73
		May	30·016	1·041	76·0	32·0	44·0	63·2	44·9	18·3	52·9	41·3	·292	3·5	1·4	71	535	88·9	41·9	2·4	8	7	4	12	4·0	4·8	10	2·01
		June	29·955	0·895	74·0	42·0	32·0	65·5	51·2	17·3	58·6	50·6	·370	4·2	1·4	75	535	100·1	49·2	2·4	8	3	7	12	3·9	5·5	11	1·83
TRURO (Cornwall), C. BARHAM, ESQ., M.D., F.M.S.	43	April	30·023	0·853	68·0	27·0	41·0	55·9	41·1	14·8	46·7	40·3	·251	2·9	0·8	80	549	—	—	2·8	14	9	2	5	—	5·8	—	—
		May	29·981	1·005	69·0	32·0	37·0	60·0	46·0	14·0	51·4	43·9	·288	3·2	1·0	76	543	—	—	2·9	12	8	0	11	—	5·4	9	1·49
		June	29·989	0·832	72·0	42·0	30·0	66·2	52·9	13·3	56·8	52·8	·400	4·6	0·8	86	537	—	—	2·4	10	2	6	12	—	6·9	11	1·38
SIDMOUTH (Devon), J. INGLEBY MACKENZIE, ESQ., M.B., F.M.S.	30	Mar.	29·765	1·065	56·6	28·3	28·3	48·6	37·6	11·0	43·1	40·7	·254	2·9	0·3	91	548	—	—	0·8	7	9	9	6	—	3·2	16	3·68
		April	30·006	0·798	61·8	31·0	30·8	53·8	40·4	13·4	46·1	42·9	·279	3·2	0·2	89	549	—	—	1·5	11	10	4	5	—	3·0	8	0·58
		May	29·971	1·066	65·0	35·5	29·5	59·2	45·3	13·9	50·9	48·1	·334	2·7	1·0	78	543	—	—	1·2	9	6	10	6	—	3·3	9	1·25
		June	29·991	0·820	69·0	43·8	25·2	64·8	51·9	12·9	57·0	55·0	·431	4·7	0·4	92	537	—	—	1·0	10	3	8	9	—	3·9	9	0·89
EASTBOURNE (Sussex), MISS W. L. HALL.	12	Feb.	30·048	1·782	49·8	27·0	22·8	41·5	32·2	9·3	36·8	33·3	·191	2·2	0·4	88	561	56·6	26·3	0·4	14	8	2	4	1·0	—	13	2·69
		Mar.	29·803	0·947	64·4	28·2	36·2	51·2	37·5	13·7	43·5	32·5	·184	2·1	1·1	65	549	88·6	29·9	0·5	3	12	11	5	3·2	—	19	2·83
		April	29·990	0·784	66·8	28·2	38·6	57·1	39·4	17·7	47·2	39·5	·243	2·8	0·9	75	548	102·3	31·9	0·5	10	10	3	7	3·5	—	12	0·73
		May	29·980	0·922	70·2	34·4	35·8	62·1	44·4	17·7	51·5	43·9	·287	3·2	1·1	76	533	109·2	37·6	0·6	7	7	7	10	5·3	—	13	1·62
OSBORNE (Isle of Wight), J. R. MANN, ESQ.	172	April	29·830	0·890	66·1	33·1	33·0	56·3	40·7	15·6	47·0	40·8	·255	3·0	0·8	80	546	95·3	34·6	—	12	7	3	8	—	6·0	9	1·25
		May	29·809	0·984	72·2	34·8	37·4	62·5	44·9	17·6	51·8	46·2	·314	3·5	0·8	81	539	101·3	36·7	—	7	5	9	10	—	5·7	13	1·00
		June	29·802	0·762	75·7	44·8	30·9	68·4	51·9	16·5	57·7	54·2	·421	4·4	0·6	88	532	108·2	43·4	—	8	3	7	12	—	7·1	12	1·54
PORTSMOUTH, WILLIAM O. ELLIS, ESQ., F.M.S.	16	April	30·005	0·783	67·4	26·2	41·2	57·0	35·1	21·9	45·0	36·0	·211	2·5	0·9	71	551	100·2	30·2	1·5	12	11	3	4	2·6	6·7	9	0·73
		May	29·972	1·001	71·2	32·0	39·2	62·1	39·9	22·2	50·0	41·8	·265	3·0	1·1	74	545	112·6	32·6	1·5	3	5	10	13	3·3	5·2	13	0·97
		June	29·958	0·777	78·0	40·4	37·6	70·9	47·5	23·4	57·0	52·4	·397	4·4	0·8	85	536	—	—	1·5	4	6	7	11	2·3	6·2	—	—
BRIGHTON (Sussex), FREDERICK E. SAWYER, ESQ., F.M.S.	200	April	29·774	0·797	68·9	28·0	40·9	53·6	39·9	13·7	45·8	38·0	·223	2·7	0·8	75	546	104·1	35·8	1·1	12	8	3	7	—	7·1	14	0·73
		May	29·769	1·036	66·5	35·4	31·1	59·2	44·4	14·8	50·6	43·4	·282	3·3	0·9	77	540	110·8	39·8	0·8	6	5	7	13	—	6·5	14	0·87
		June	29·766	0·797	77·2	43·0	34·2	67·5	52·1	15·4	59·0	54·2	·421	4·8	0·8	85	531	112·6	48·7	0·7	3	3	12	12	—	8·1	12	1·99
LYMINGTON (Hants), GEORGE J. JONES, ESQ.	77	April	29·930	0·750	72·0	25·8	46·2	56·6	39·0	17·6	47·5	38·6	·284	2·7	1·0	72	547	—	35·3	1·7	11	9	3	7	—	5·8	7	0·85
		May	29·912	0·889	70·0	32·4	37·6	60·8	43·1	17·7	50·8	42·2	·270	3·1	1·1	74	543	—	38·9	1·6	7	6	8	10	—	5·7	11	1·14
		June	29·894	0·755	73·0	41·8	31·2	66·0	50·1	15·9	57·0	52·6	·397	4·3	0·8	85	535	—	44·9	1·6	8	5	8	9	—	6·5	11	1·78
TAUNTON (Somerset), REV. W. TUCKWELL, F.M.S.	80	June	29·888	0·747	79·1	41·0	38·1	69·2	50·4	18·8	57·7	51·6	·383	4·3	0·9	80	534	82·9	49·4	0·2	9	6	5	10	4·7	7·9	12	1·49
WILTON HOUSE (near Salisbury), T. CHALLIS, ESQ.	186	April	29·803	0·797	74·5	26·0	48·5	58·4	35·5	22·9	45·9	37·9	·228	2·8	0·6	74	546	101·4	32·6	1·2	12	11	4	3	4·5	6·4	6	1·01
		May	29·763	1·024	73·5	27·5	46·0	65·3	40·0	25·3	51·2	44·3	·292	3·3	0·8	78	539	110·1	36·7	1·2	11	6	4	10	4·8	6·0	11	1·35
		June	29·748	0·737	81·0	39·0	42·0	71·5	47·2	24·3	57·8	53·8	·410	4·6	0·6	86	531	111·4	45·4	1·3	9	4	6	11	4·5	7·4	10	2·45
BARNSTAPLE (Devon), T. MACKRELL, ESQ.	43	April	29·998	0·829	66·0	31·5	34·5	57·0	41·9	15·1	48·2	41·7	·262	3·0	0·8	79	547	—	—	1·2	10	8	5	7	—	3·7	10	1·11
		May	29·978	1·063	72·0	37·5	34·5	61·9	46·1	15·8	52·9	47·0	·327	3·6	0·9	81	541	—	—	1·3	4	4	11	12	—	3·5	11	2·30
		June	29·941	0·801	73·0	44·0	29·0	68·1	52·9	15·2	58·7	52·4	·395	4·4	1·0	80	534	—	—	1·3	3	3	11	13	—	5·3	11	1·50
ALDERSHOT CAMP (Hants), JOHN ARNOLD, ESQ., M.S.C., F.M.S.	325	April	29·684	0·681	77·4	25·6	51·8	57·0	37·1	19·9	45·3	38·9	·231	2·7	0·8	76	544	98·8	33·4	1·8	12	6	4	8	2·8	6·6	10	0·55
		May	29·603	0·935	75·0	32·0	43·0	64·3	40·8	23·5	49·6	40·5	·253	2·7	1·2	75	538	115·2	37·2	1·6	9	6	5	11	2·3	6·3	12	1·24
		June	29·598	0·744	79·6	42·0	37·6	70·3	50·2	20·1	57·6	50·8	·371	4·1	1·1	78	529	119·1	46·2	1·5	6	8	9	12	2·6	7·7	10	1·61

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING SEPTEMBER 30, 1873.

Remarks on the Weather during the Quarter ending September 30th, 1873.

By James Glaisher, Esq., F.R.S., *&c.*

Till the 19th of July the weather was mostly cold, and the mean daily temperatures were below their seasonable averages by ¾°. On July 20th a sudden change took place, and for a few days the weather was fine and hot, particularly on the 21st, 22d, and 23d, the mean temperatures of these days being 71°·7, 75°·2, and 72°·3, exceeding their averages by 10°·2, 13°·7, and 10°·7 respectively. In the year 1818 the mean temperature of the 23d, 24th, 25th, and 26th of July were 72°·7, 79°·2, 70°·7, and 72°·0 respectively; a similar very warm period in July 1825 continued from the 13th to the 20th, with mean daily temperatures of 70°·6, 71°·3, 79°·1, 74°·1, 73°·9, 78°·2, 78°·6, and 70°·8. In July 1826 a warm period was experienced from the 2d to the 9th, the mean daily values were 71°·8, 71°·7, 74°·3, 73°·9, 72°·3, 73°·1, 72°·6, and 71°·3. In 1830 from July 25th to 30th the average daily temperature was 72°·3, the value for the 30th being 76°·3. In 1836 the mean temperature of July 1st to 6th was 73°·0, with a maximum daily temperature of 76°·7; in 1847 the mean from July 11th to 14th was 72°·4, and in 1859 the mean temperature of July 11th to 13th and 16th to 19th was 73°·3, with a maximum mean daily temperature of 75°·7.

Immediately following those few warm days beginning July 20th, 1873, the weather was again cold, and from July 20th to September 2d the weather was changeable, the whole period being characterised by several days of warm weather, followed by a few days of cold, and then succeeded by several warm days again; the warm days were, however, the more numerous, and upon the whole period there was an excess of temperature averaging 2½° on the 45 days ending September 2d. From September 3d there was a fortnight of continued cold weather, and for the most part the weather was cold to the end of the quarter; the deficiency of mean temperature upon the last 28 days of the quarter somewhat exceeded an average of 2° daily.

Rain fell very frequently during the first half of July, during the whole month of August, and the first half of September; and but little fell during the second halves of July and September.

The wind during the whole quarter was nearly always West, or a compound of the West with the South; the winds from the North and East were insignificant in duration.

The average duration of the different directions of the wind in days, and the duration of each direction in each month in the quarter, are as follows:—

Direction of Wind.	July.			August.			September.		
	Average.	1873.	Departure from Average.	Average.	1873.	Departure from Average.	Average.	1873.	Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	2½	1	−1½	2	2	0	1½	1	− ½
N.	3¼	1	−2¼	3	0	−3	3¼	3	− ¼
N.E.	3¾	0	−3¾	3	0	−3	5½	2	−3½
E.	1	1	0	1	1	0	1½	2	+ ½
S.E.	1	1	0	1¼	1	− ¼	1¾	3	+1¼
S.	2½	3	+ ½	3	2	−1	2	2	0
S.W.	10½	15	+4½	10½	16	+5½	7¼	8	+ ¾
W.	4	8	+4	3¾	8	+4¼	2½	8	+5½
Calm, nearly.	2¾	1	−1¾	3½	1	−2½	4¼	1	−3¼

The + signs denoting excesses over averages in the months of July and August, are confined to the S., S.W. and W. winds; in September these winds also preponderated, but there are in addition some + signs to compounds of E. in this month. During each month the deficiencies of the N. and its compounds are shown by the sign − being prevalent in every month.

The mean temperature for the month of July at Greenwich was 4½° above that in June; that in August was ¾° below that in July; and September was no less than 8° below that in August. The mean increase from all stations from June to July was 3°·8; and the mean decrease from July to August was 0°·7; and from August to September was 6°·0.

The decrease of mean temperature from August to September at Greenwich of so large an amount as 8° is rare; back to 1773 the only instances of so large a decline are as follows:

1778 the decrease was	10°·1.	1842 the decrease was	9°·0.
1803 „	9°·3.	1856 „	8°·4.
1807 „	10°·6.	1863 „	8°·2.
1840 „	8°·0.		

The readings of the barometer at 159 feet above sea level were very variable throughout July, but the movements were not of very great magnitude. The highest reading in the month was 30·0 in. on the 21st, and the lowest 29·2 in. on the 13th, thus giving a range of 0·8 in. The mean daily values were below the average as a rule till the 15th, but above during the remainder of the month. Tolerably high readings were experienced from the 1st to the 17th August, but in very few cases, however, exceeding 30 in., but from the 18th to the end of the month a low wave was prevalent, the average value for the 28th being 29·4 in. The range of reading in the month was but 0·7 in. The low readings of the latter end of August continued till the 18th September; a rather large depression being recorded on the 13th, 14th, and 15th; the minimum, 29·1 in., occurring about noon on the last-mentioned day. On the 21st the readings passed above 30 in., and continued in excess of that point till the 26th, the mean excess above average daily being nearly 0·4 in. The maximum for the month was 30·36 in. on the 22d, and minimum 29·08 in. on the 15th, thus giving a range of 1·28 in.

The mean decrease of readings from all the stations from June to July was 0·021 in.; from July to August was 0·023 in., and from August to September at all stations south of latitude 53° there was an increase of 0·034 in., and north of this parallel, there was a decrease of 0·051 in.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
NORWICH (Norfolk), C. M. Gibson, Esq., F.M.S.	42	Jan.	29·681	1·715	53·5	26·0	27·5	45·1	35·9	9·2	40·6	38·1	·230	2·7	0·3	91	550	—	—	—	5	4	13	9	—	—	16	2·22
		Feb.	30·027	1·960	50·0	21·5	28·5	38·9	29·9	9·0	34·2	32·3	·184	2·2	0·2	93	564	—	—	—	9	5	3	11	—	—	12	1·93
		Mar.	29·763	1·092	58·0	26·5	31·5	47·1	33·3	13·8	39·7	37·9	·228	2·7	0·2	94	552	—	—	—	7	12	6	6	—	—	14	1·68
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	Jan.	29·684	1·715	55·0	22·0	33·0	46·0	36·7	9·3	40·4	38·4	·236	2·7	0·2	93	550	65·0	33·4	0·7	3	7	13	8	5·9	6·3	16	1·88
		Feb.	30·065	2·004	50·0	25·0	25·0	39·5	31·3	8·2	34·6	33·0	·189	2·2	0·1	94	564	56·9	28·8	0·5	9	5	6	8	1·9	8·8	14	1·69
		Mar.	29·786	1·122	65·0	26·5	38·5	49·5	34·7	14·8	40·9	39·0	·237	2·8	0·2	93	551	84·3	31·0	0·7	10	10	6	5	2·6	7·0	19	1·56
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	Jan.	29·491	1·785	54·9	28·4	26·5	47·9	38·6	9·3	43·3	38·2	·230	2·7	0·5	81	543	—	—	0·8	2	2	10	17	—	6·8	22	5·81
		Feb.	30·029	1·981	50·0	25·6	24·4	42·3	33·6	8·7	38·5	32·7	·185	2·2	0·5	79	559	—	—	0·8	7	5	2	14	—	7·7	11	1·23
		Mar.	29·682	1·103	68·7	30·6	38·1	50·0	37·6	12·4	43·6	37·7	·226	2·6	0·6	79	547	—	—	0·6	3	13	6	9	—	6·7	12	2·09
DERBY (Derbyshire), John Davis, Esq.	174	Jan.	29·466	1·722	55·0	24·0	31·0	45·3	36·8	8·5	40·9	37·8	·227	2·7	0·4	89	546	—	—	—	1	5	16	9	—	—	14	2·04
		Feb.	29·902	1·967	50·0	22·0	28·0	40·3	31·1	9·2	35·4	32·3	·184	2·1	0·3	89	560	—	—	—	8	4	5	11	—	—	11	0·68
		Mar.	29·605	1·152	61·0	27·0	34·0	47·6	34·5	13·1	40·2	35·7	·213	2·6	0·9	86	549	—	—	—	7	10	6	8	—	—	14	2·15
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	241	Jan.	29·393	1·735	55·0	19·1	35·9	46·2	38·2	8·0	41·6	38·5	·233	2·7	0·2	89	543	—	28·0	0·5	3	5	17	6	0·5	6·9	20	2·19
		Feb.	29·825	1·947	51·5	20·3	31·2	40·2	29·5	10·7	34·4	31·2	·176	2·1	0·2	89	560	—	22·2	0·7	11	5	4	8	0·3	6·9	14	0·91
		Mar.	29·536	1·113	63·8	24·2	39·6	49·3	33·7	15·6	40·3	37·6	·225	2·6	0·2	90	547	59·4	25·6	0·7	7	12	6	6	1·0	8·2	19	1·92
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	Dec.	29·522	1·224	53·0	26·2	26·8	45·9	35·4	10·5	41·4	38·2	·231	2·7	0·4	89	546	51·5	28·7	1·2	6	4	16	5	—	7·3	19	3·30
		Jan.	29·666	1·705	54·5	23·5	31·0	46·1	35·7	10·4	41·2	37·0	·220	2·5	0·5	85	549	56·5	29·3	1·6	1	4	22	4	—	6·2	16	1·80
		Feb.	30·084	1·514	51·2	15·6	35·6	40·1	29·4	10·7	34·9	30·1	·167	2·0	0·4	81	563	59·0	24·4	1·0	10	5	7	16	—	8·5	14	3·18
HAWARDEN (Flint), T. Moffat, Esq., M.D., F.R.A.S.	270	Jan.	29·332	1·744	53·5	27·0	26·5	44·6	37·9	6·7	40·7	37·8	·227	2·5	0·4	89	543	61·2	18·6	2·3	4	3	14	10	2·6	6·9	20	2·15
		Feb.	29·782	1·938	47·0	25·0	22·0	39·2	32·4	6·8	35·6	32·5	·184	2·1	0·4	86	558	68·2	15·5	1·8	12	4	4	8	2·0	6·7	15	0·89
		Mar.	29·510	1·164	60·0	30·0	30·0	47·1	36·2	10·9	40·2	37·5	·224	2·6	0·3	90	547	84·2	17·3	2·0	7	8	12	4	1·2	6·8	19	3·44
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	Jan.	29·421	1·776	55·0	28·2	26·8	46·8	38·2	8·6	42·2	37·3	·223	2·6	0·5	84	543	—	—	1·6	1	7	15	8	—	6·9	19	2·19
		Feb.	29·926	1·888	49·7	24·1	25·6	40·8	32·3	8·5	36·2	32·2	·184	2·1	0·4	86	560	—	—	1·1	9	5	5	9	—	7·6	8	0·45
		Mar.	29·603	1·148	62·4	29·8	32·6	47·8	35·8	12·0	41·1	36·2	·212	2·4	0·6	82	548	—	—	1·3	8	14	5	4	—	6·3	15	2·74
ECCLES (near Manchester), T. Mackereth, Esq., F.R.A.S., F.M.S.	145	Jan.	29·474	1·800	54·5	24·0	30·5	46·2	36·2	10·0	41·3	36·8	·218	2·5	0·5	85	545	49·1	29·3	1·0	2	6	16	7	4·3	6·6	21	3·81
		Feb.	29·960	1·958	47·6	14·6	33·0	41·1	29·8	11·3	35·5	31·0	·174	2·0	0·5	84	561	45·8	24·1	0·4	9	7	5	7	1·6	7·6	17	0·55
		Mar.	29·643	1·154	65·5	27·2	38·3	49·8	34·2	15·6	41·7	36·5	·216	2·5	0·6	83	548	60·6	27·2	0·2	6	12	8	5	2·0	5·9	17	2·69
MOOR SIDE OBSERVATORY, HALIFAX, (Yorkshire), Louis J. Crossley, Esq., F.M.S.	429	Jan.	29·082	1·817	52·5	16·5	36·0	44·1	34·6	9·5	39·2	36·5	·216	2·5	0·3	90	540	57·6	31·1	—	2	6	13	10	2·8	6·4	22	4·82
		Feb.	29·552	1·932	49·4	6·0	43·4	39·5	32·0	7·5	34·6	32·0	·182	2·2	0·2	92	554	59·4	27·0	1·1	12	4	3	9	3·9	8·4	14	0·70
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	Jan.	29·620	1·835	53·0	23·0	30·0	44·7	36·0	8·7	40·4	37·4	·223	2·7	0·3	90	549	54·2	33·3	—	-	-	-	-	4·4	—	15	1·91
		Feb.	30·080	1·962	49·0	12·0	37·0	39·9	30·2	9·7	34·6	32·0	·182	2·1	0·3	91	564	53·6	28·1	—	-	-	-	-	3·1	—	17	1·72
		Mar.	29·804	1·131	56·0	24·0	32·0	45·7	33·5	12·2	38·2	36·5	·216	2·5	0·4	95	555	64·4	31·4	—	-	-	-	-	2·4	—	17	2·48
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	363	Jan.	29·232	1·850	52·6	18·7	33·9	44·8	36·3	8·5	40·2	36·8	·218	2·5	0·4	89	542	66·2	31·5	—	2	5	15	9	—	7·7	28	6·17
		Feb.	29·715	1·950	44·8	12·3	32·5	40·4	31·3	9·1	35·2	32·5	·183	2·1	0·3	89	557	71·2	26·5	—	10	4	2	12	—	7·7	16	0·82
		Mar.	29·407	1·198	60·7	28·8	31·9	47·6	35·8	11·8	40·5	34·5	·200	2·3	0·4	80	545	90·9	30·1	—	7	14	4	6	—	7·3	25	3·40
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	Jan.	29·184	1·822	54·8	22·8	32·0	46·3	36·9	9·4	41·1	38·4	·232	2·7	0·3	90	540	49·4	—	1·6	-	-	-	-	—	4·7	19	3·22
		Feb.	29·680	1·917	48·8	27·2	21·6	41·9	32·2	9·7	36·8	33·0	·188	2·2	0·3	87	554	49·1	—	0·8	-	-	-	-	—	6·1	—	—
		Mar.	29·377	1·219	58·0	28·8	29·2	46·3	35·0	11·3	40·1	36·2	·203	2·5	0·4	86	545	59·6	—	1·0	-	-	-	-	—	5·4	14	2·90
LEEDS PHILOSOPHICAL HALL (Yorkshire), Louis C. Miall, Esq.	137	Jan.	29·476	1·889	53·0	24·0	29·0	45·4	32·8	12·6	40·3	34·6	·200	2·3	0·6	80	547	51·0	—	1·5	2	4	8	17	—	8·7	19	2·37
		Feb.	29·956	1·961	52·0	15·0	37·0	41·0	30·9	10·1	36·2	30·1	·175	1·9	0·6	79	560	49·7	—	1·2	13	5	2	8	—	9·2	14	0·88
		Mar.	29·654	1·190	62·0	28·0	34·0	47·9	34·0	13·9	40·4	36·0	·213	2·5	0·4	85	556	56·8	—	1·4	8	11	6	6	—	7·3	18	2·28
YORK (Yorkshire), J. F. Fryer, Esq.	50	Jan.	29·547	1·686	51·5	17·0	34·5	41·7	33·7	8·0	38·2	37·7	·226	2·7	0·1	98	550	—	—	—	-	-	-	-	—	—	14	2·25
		Feb.	29·995	1·973	45·0	10·0	35·0	36·7	29·8	8·9	34·3	31·8	·180	2·1	0·2	90	563	—	—	—	4	15	8	8	—	—	13	1·28
		Mar.	29·797	1·356	57·0	27·0	30·0	44·6	33·7	10·9	38·4	37·0	·220	2·5	0·4	95	553	—	—	—	8	12	9	2	—	—	15	2·16
COCKERMOUTH (Cumberland), H. Dodgson, Esq., M.D., F.R.A.S., F.M.S.	146	Jan.	29·379	2·036	52·2	22·6	29·6	45·4	36·7	8·7	41·1	36·4	·214	2·5	0·5	85	544	52·3	30·1	1·1	2	7	13	9	3·7	6·2	23	8·48
		Feb.	29·934	1·940	47·6	11·8	36·1	41·4	30·2	11·2	35·0	31·4	·179	2·1	0·3	80	561	52·6	22·0	0·9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Mar.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING SEPTEMBER 30, 1873.

REMARKS ON THE WEATHER DURING THE QUARTER ENDING SEPTEMBER 30TH, 1873.

By JAMES GLAISHER, ESQ., F.R.S., *&c.*

Till the 19th of July the weather was mostly cold, and the mean daily temperatures were below their seasonable averages by ¾°. On July 20th a sudden change took place, and for a few days the weather was fine and hot, particularly on the 21st, 22d, and 23d, the mean temperatures of these days being 71°·7, 75°·2, and 72°·3, exceeding their averages by 10°·2, 13°·7, and 10°·7 respectively. In the year 1818 the mean temperature of the 23d, 24th, 25th, and 26th of July were 72°·7, 79°·2, 70°·7, and 72°·0 respectively; a similar very warm period in July 1825 continued from the 13th to the 20th, with mean daily temperatures of 70°·6, 71°·3, 79°·1, 74°·1, 73°·9, 78°·2, 78°·6, and 70°·8. In July 1826 a warm period was experienced from the 2d to the 9th, the mean daily values were 71°·8, 71°·7, 74°·3, 73°·9, 72°·3, 73°·1, 72°·6, and 71°·3. In 1830 from July 25th to 30th the average daily temperature was 72°·3, the value for the 30th being 76°·3. In 1836 the mean temperature of July 1st to 6th was 73°·0, with a maximum daily temperature of 76°·7; in 1847 the mean from July 11th to 14th was 72°·4, and in 1859 the mean temperature of July 11th to 13th and 16th to 19th was 73°·3, with a maximum mean daily temperature of 75°·7.

Immediately following those few warm days beginning July 20th, 1873, the weather was again cold, and from July 20th to September 2d the weather was changeable, the whole period being characterised by several days of warm weather, followed by a few days of cold, and then succeeded by several warm days again; the warm days were, however, the more numerous, and upon the whole period there was an excess of temperature averaging 2½° on the 45 days ending September 2d. From September 3d there was a fortnight of continued cold weather, and for the most part the weather was cold to the end of the quarter; the deficiency of mean temperature upon the last 28 days of the quarter somewhat exceeded an average of 2° daily.

Rain fell very frequently during the first half of July, during the whole month of August, and the first half of September; and but little fell during the second halves of July and September.

The wind during the whole quarter was nearly always West, or a compound of the West with the South; the winds from the North and East were insignificant in duration.

The average duration of the different directions of the wind in days, and the duration of each direction in each month in the quarter, are as follows:—

Direction of Wind.	JULY.			AUGUST.			SEPTEMBER.		
	Average.	1873.	Departure from Average.	Average.	1873.	Departure from Average.	Average.	1873.	Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	2½	1	−1½	2	2	0	1½	1	−½
N.	3¼	1	−2¼	3	0	−3	3½	3	−½
N.E.	3½	0	−3½	3	0	−3	5¼	2	−3¼
E.	1	1	0	1	1	0	1¾	2	+¼
S.E.	1	1	0	1½	1	−½	1½	3	+1½
S.	2¾	3	+¼	3	2	−1	2	2	0
S.W.	10½	15	+4½	10½	16	+5½	7½	8	+½
W.	4	8	+4	3½	8	+4½	2¾	8	+5¼
Calm, nearly.	2½	1	−1½	3½	1	−2½	4½	1	−3½

The + signs denoting excesses over averages in the months of July and August, are confined to the S., S.W. and W. winds; in September these winds also preponderated, but there are in addition some + signs to compounds of E. in this month. During each month the deficiencies of the N. and its compounds are shown by the sign − being prevalent in every month.

The mean temperature for the month of July at Greenwich was 4½° above that in June; that in August was ¾° below that in July; and September was no less than 8° below that in August. The mean increase from all stations from June to July was 3°·8; and the mean decrease from July to August was 0°·7; and from August to September was 6°·0.

The decrease of mean temperature from August to September at Greenwich of so large an amount as 8° is rare; back to 1773 the only instances of so large a decline are as follows:

1778 the decrease was	10°·1.	1842 the decrease was	9°·0.
1803 „	9°·3.	1856 „	8°·4.
1807 „	10°·6.	1863 „	8°·2.
1840 „	8°·0.		

The readings of the barometer at 159 feet above sea level were very variable throughout July,

Cardington and Hull; on the 7th at Bywell; on the 9th and 10th at Carlisle; on the 11th at Hawarden; on the 12th at Gloucester, Cardington, and Leeds; on the 13th at Cardington and Stonyhurst; on the 14th at Guernsey, Taunton, Gloucester, Cardington, Halifax, Hull, and Stonyhurst; on the 15th at Osborne, Portsmouth, Royston, Norwich, Halifax, Hull, Cockermouth, and Silloth; on the 16th at Salisbury; on the 22d at Guernsey and Streatley; on the 23d at Cardington, Stonyhurst, and Allenheads; on the 27th at Streatley, Wisbech, Eccles, and Carlisle;

BYWELL.—The harvest is quite finished in this neighbourhood, and all is secured in pretty good condition. Wheat is below the average, barley and oats are a good average. Field potatoes are pretty free from disease, but garden potatoes are much diseased. Turnips are a good crop; the *pastures are improving.*

COCKERMOUTH.—The grain crop had not been all secured at the end of the month.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING SEPTEMBER 30TH, 1873.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Pressure Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Dew Point.	Vapour. Elastic Force.	In a cubic foot of Air. Mean.	Short of Saturation.	Mean Degree of Humidity. Sat. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Minimum on Grass.	Wind. Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S., F.M.S.	204	July	29·782	0·832	81·0	50·5	30·5	67·6	56·7	10·9	61·0	56·2	·451	5·0	1·0	84	528	–	–	1·1	3	4	12	12	3·7	4·2	9	3·34
		Aug.	29·780	0·596	73·0	53·0	20·0	66·5	56·8	9·7	60·6	53·7	·413	4·6	1·3	78	529	–	–	1·2	5	3	11	12	3·5	5·2	15	5·09
		Sept.	29·788	1·142	65·5	48·5	17·0	61·4	53·5	7·9	56·9	51·9	·387	4·3	1·0	83	533	–	–	1·2	7	5	8	10	4·3	4·9	16	2·34
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	106	July	29·974	0·718	80·0	45·0	35·0	71·8	53·0	18·8	61·8	55·2	·436	5·0	0·5	76	527	101·0	51·0	2·2	3	3	13	12	4·1	3·7	15	3·84
		Aug.	29·960	0·714	76·0	48·0	28·0	70·4	55·8	14·6	61·8	55·2	·436	5·0	1·5	78	528	92·7	51·7	2·3	2	3	12	14	4·0	5·3	21	4·05
		Sept.	29·996	1·010	74·0	46·0	28·0	66·0	52·9	13·1	57·1	50·6	·369	4·3	1·4	75	533	87·7	46·9	2·1	8	6	5	11	4·5	4·2	14	3·13
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	July	29·957	0·704	79·0	43·0	36·0	68·6	53·0	15·6	59·4	51·8	·386	4·3	1·3	76	534	–	–	2·5	2	3	7	19	–	5·7	18	3·69
		Aug.	29·948	0·724	81·0	45·0	36·0	67·6	55·9	11·7	59·6	53·6	·411	4·6	1·1	81	533	–	–	2·7	5	3	5	18	–	6·7	24	4·31
		Sept.	29·974	1·116	70·0	40·0	30·0	63·3	50·8	12·5	55·5	50·0	·363	4·1	0·9	83	538	–	–	2·7	9	7	3	11	–	5·8	19	2·41
SIDMOUTH (Devon), J. Ingleby Mackenzie, Esq., M.B., F.M.S.	30	July	29·954	0·859	77·0	46·0	31·0	67·6	52·7	14·9	59·4	56·4	·466	5·2	0·6	90	533	–	–	1·4	1	2	10	18	–	3·0	14	1·67
		Aug.	29·935	0·756	73·6	47·4	26·2	66·8	55·1	11·7	60·1	56·1	·452	5·1	0·7	87	532	–	–	1·6	7	2	10	12	–	3·6	16	3·99
		Sept.	29·961	1·352	66·2	43·8	22·4	61·6	50·5	11·1	55·4	50·9	·372	4·3	0·6	88	548	–	–	1·4	10	3	5	12	–	3·9	13	2·36
EASTBOURNE (Sussex), Miss W. L. Hall.	12	June	29·983	0·759	73·8	42·1	31·7	67·3	51·1	16·2	57·7	52·0	·391	4·3	1·0	82	537	113·7	45·5	0·4	4	5	8	13	6·4	–	11	2·35
		July	29·991	0·524	82·0	50·6	31·4	71·1	56·1	15·0	62·2	55·3	·449	4·9	1·4	79	530	120·8	49·1	0·7	3	3	9	16	5·6	–	8	1·71
OSBORNE (Isle of Wight), J. R. Mann, Esq.	172	July	29·805	0·773	84·2	46·4	37·8	72·6	54·7	17·9	62·0	55·5	·412	4·9	1·3	79	528	109·5	45·8	0·1	1	4	9	17	–	5·1	8	1·96
		Aug.	29·783	0·664	86·7	51·9	34·8	71·7	55·9	15·8	62·0	55·5	·442	4·9	1·3	79	528	106·6	45·6	0·1	3	2	10	16	–	6·5	20	1·65
		Sept.	29·809	1·226	72·0	43·6	28·4	64·7	51·0	13·7	56·4	51·6	·383	4·4	0·8	84	534	95·4	39·8	0·1	5	6	8	11	–	6·4	13	2·45
BOURNEMOUTH (Hants), T. A. Compton, Esq., M.D., B.A., F.M.S.	128	April	30·039	0·780	63·4	30·3	33·1	54·7	39·5	15·2	45·2	38·6	·236	2·7	0·9	76	550	–	–	–	12	6	4	8	–	4·0	9	0·97
		May	30·024	0·920	66·0	33·9	32·1	58·8	44·0	14·8	50·9	43·5	·284	3·3	0·9	87	544	–	–	–	6	6	9	10	–	2·9	10	0·94
		June	30·009	0·670	70·9	44·2	26·7	64·7	51·4	13·3	56·8	51·2	·377	4·2	1·0	82	537	–	–	–	6	3	7	14	–	4·6	13	1·56
		July	30·010	0·990	78·7	46·1	32·6	68·9	55·1	13·8	61·4	53·2	·405	4·5	1·2	75	532	–	–	–	2	3	6	20	–	2·0	10	2·00
		Aug.	29·934	0·510	77·4	50·9	24·5	68·6	56·6	12·0	61·8	53·6	·412	4·6	1·6	75	530	–	–	–	2	1	8	20	–	3·4	14	2·48
		Sept.	29·989	1·340	65·0	41·0	24·0	61·9	49·9	12·0	55·3	48·8	·345	3·9	0·9	79	539	–	–	–	5	3	6	16	–	2·8	15	2·34
PORTSMOUTH, William O. Ellis, Esq., F.M.S.	16	July	29·953	0·777	82·2	45·2	37·0	74·0	51·6	22·4	61·8	53·1	·423	4·5	1·7	74	531	–	–	1·6	1	3	14	13	–	3·5	–	–
WORTHING (Sussex), W. J. Harris, Esq., M.R.C.S.E., L.S.A.	31	July	29·968	0·814	77·2	47·9	29·3	68·3	55·7	12·6	61·0	54·2	·421	4·6	1·5	76	522	121·9	49·4	1·2	1	3	10	17	4·7	4·3	9	1·56
		Aug.	29·932	0·638	74·2	48·8	25·4	69·2	56·4	12·8	61·5	55·4	·441	4·9	1·2	81	531	120·5	50·9	1·0	2	3	9	17	4·6	5·6	14	1·92
		Sept.	29·943	1·342	68·6	43·5	25·1	63·7	50·6	13·1	56·4	50·8	·372	4·2	0·8	81	536	109·3	46·3	0·9	6	5	6	14	2·4	5·4	12	2·43
BRIGHTON (Sussex), Frederick E. Sawyer, Esq., F.M.S.	206	July	29·779	0·773	81·0	49·4	31·6	71·1	55·7	15·4	62·2	53·5	·411	4·5	1·7	73	527	119·5	51·0	1·1	1	3	14	13	–	6·2	10	1·82
		Aug.	29·774	0·636	74·7	49·5	25·2	70·5	56·1	14·4	62·2	54·2	·421	4·6	1·6	75	527	115·6	52·3	1·3	1	3	10	17	–	5·3	14	2·92
		Sept.	29·767	1·221	67·5	44·0	23·5	62·3	49·7	12·6	55·3	48·6	·346	3·9	1·0	79	535	123·6	37·9	1·0	6	5	7	12	–	6·3	13	2·89
LYMINGTON (Hants), George J. Jones, Esq.	77	July	29·899	0·604	82·8	41·6	41·2	69·9	52·9	17·0	60·4	52·6	·396	4·4	1·5	75	532	–	48·6	1·5	2	3	13	13	–	5·5	6	2·08
		Aug.	29·867	0·730	81·8	49·7	32·1	70·3	55·3	15·0	62·0	52·7	·399	4·4	1·8	72	529	–	52·2	1·7	2	2	9	18	–	5·1	13	2·41
		Sept.	29·901	1·279	70·6	40·3	30·3	64·5	48·6	15·9	56·3	48·4	·442	3·9	1·2	75	536	–	46·2	1·2	7	6	5	12	–	5·3	8	2·37
TAUNTON (Somerset), Rev. W. Tuckwell, F.M.S.	80	July	29·868	0·630	95·0	43·5	51·5	73·7	51·7	22·0	62·6	53·4	·409	4·5	1·8	72	529	85·3	46·0	0·8	2	2	6	21	7·5	5·7	19	2·13
		Aug.	29·832	0·950	82·8	36·0	46·8	70·8	53·8	17·0	60·5	54·4	·424	4·7	1·2	81	530	81·0	49·3	0·4	5	2	5	19	5·8	6·6	16	4·10
		Sept.	29·897	1·365	73·2	37·2	36·0	64·2	47·2	17·0	54·8	48·7	·544	3·9	0·9	79	538	74·7	40·0	0·2	8	5	5	12	2·2	6·8	16	1·99
WILTON HOUSE (near Salisbury), T. Challis, Esq.	186	July	29·776	0·647	89·0	41·5	47·5	75·0	49·8	25·7	61·0	55·6	·442	4·9	1·1	85	528	121·8	46·7	1·2	8	1	14	13	–	6·2	14	1·40
		Aug.	29·751	0·699	87·0	42·0	45·0	74·4	51·2	23·2	61·4	56·6	·459	5·1	1·0	84	527	119·2	49·2	1·4	3	1	8	19	–	6·8	16	2·65
		Sept.	29·769	1·266	74·8	35·0	39·8	65·4	44·0	21·4	54·0	50·0	·360	4·1	0·6	88	536	100·2	41·5	1·3	4	6	6	14	–	5·4	12	1·99

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean. Of all Highest.	Mean. Of all Lowest.	Mean. Daily Range.	Mean Temperature. Air.	Dew Point.	Vapour. Elastic Force.	In a Cubic foot of Air. Mean.	In a Cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat.=100.	Mean Weight of cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Minimum on Grass.	Wind. Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
BARNSTAPLE (Devon), T. MACKRELL, Esq.	43	July	29·907	0·779	83·5	44·5	39·0	70·4	54·6	15·8	60·7	56·1	·459	5·1	0·8	87	531	—	—	1·1	0	3	16	12	—	3·5	21	4·50
		Aug.	29·890	0·794	77·5	51·0	26·5	69·0	56·9	12·1	61·2	57·0	·464	5·1	0·9	86	530	—	—	1·3	0	2	16	13	—	4·8	24	7·19
		Sept.	29·925	1·330	75·5	41·0	34·5	64·6	51·3	13·3	56·6	52·0	·388	4·3	0·8	85	536	—	—	1·2	4	8	6	12	—	3·5	20	3·16
ALDERSHOT CAMP (Hants), JOHN ARNOLD, Esq., M.S.C., F.M.S.	325	July	29·614	0·780	89·4	45·0	44·4	75·5	53·1	22·4	62·9	55·0	·433	4·8	1·7	74	524	129·1	50·4	1·6	2	2	14	13	2·1	6·3	11	2·13
		Aug.	29·581	0·626	89·6	47·8	41·8	74·8	54·4	20·4	62·3	52·0	·389	4·3	1·8	72	525	125·4	52·1	1·6	4	2	9	16	2·6	7·1	17	1·98
		Sept.	29·680	1·276	70·8	37·8	33·0	64·2	46·6	17·6	54·2	48·2	·336	3·8	0·9	80	533	103·8	44·9	1·6	6	5	7	12	—	6·6	12	2·64
STRATHFIELD TURGISS (Hants), REV. C. H. GRIFFITH, M.A., F.M.S.	197	July	29·763	0·792	87·7	43·3	44·4	73·1	52·5	20·6	61·7	52·6	·397	4·4	1·7	73	529	131·7	47·2	0·6	1	3	10	17	6·0	4·9	7	1·89
		Aug.	29·743	0·704	82·6	46·9	35·7	72·1	54·1	18·0	61·7	52·6	·397	4·4	1·6	73	527	130·1	47·6	0·6	4	3	7	17	5·5	6·5	15	1·80
		Sept.	29·769	1·269	70·4	37·3	33·1	63·7	45·9	17·8	54·2	49·3	·352	4·0	0·7	80	540	113·3	40·6	0·7	7	6	5	12	4·0	5·4	15	2·10
WEYBRIDGE HEATH (Surrey), WILLIAM F. HARRISON, Esq., F.M.S.	150	Sept.	29·841	1·253	74·0	35·0	39·0	65·2	45·1	20·1	53·7	47·8	·330	3·8	0·9	80	538	100·4	42·0	0·6	6	7	11	6	0·9	4·9	13	2·45
MARLBOROUGH COLLEGE (Wilts), REV. THOMAS A. PRESTON, M.A., F.M.S.	183	July	29·496	0·773	88·2	41·4	46·8	70·1	50·9	19·2	59·3	51·0	·374	4·2	1·5	74	526	140·6	45·7	—	5	1	9	16	3·6	5·9	16	2·15
		Aug.	29·473	0·728	77·3	44·3	33·0	68·3	53·3	15·0	59·0	52·2	·391	4·4	1·2	79	525	135·9	48·9	—	3	0	8	20	6·2	6·9	16	2·52
		Sept.	29·506	1·355	70·8	36·5	34·3	61·4	45·8	15·6	53·3	48·1	·336	3·8	0·7	82	532	115·5	40·7	—	4	6	6	14	5·4	6·1	16	3·14
ROYAL OBSERVATORY (Kent), THE ASTRONOMER ROYAL.	159	July	29·793	0·818	88·7	46·4	42·3	76·6	53·9	22·7	63·4	54·9	·431	4·8	1·7	74	526	138·0	47·6	0·3	2	2	11	16	—	6·0	9	1·85
		Aug.	29·765	0·708	87·3	47·9	39·4	74·7	54·4	20·3	62·7	54·4	·424	4·7	1·6	75	527	128·8	48·7	0·3	2	2	10	17	—	6·3	14	3·18
		Sept.	29·792	1·282	72·5	38·2	34·3	65·2	46·1	19·1	54·7	49·0	·348	4·0	0·8	81	536	110·4	39·4	0·3	6	5	7	12	—	5·6	10	2·52
STREATLEY VICARAGE (Berks), REV. J. SLATTER, M.A., F.R.A.S., F.M.S.	150	July	29·845	0·826	93·0	44·5	48·5	75·0	51·0	24·0	61·5	54·3	·410	4·6	1·5	77	529	86·7	—	2·0	2	1	11	17	—	5·3	14	2·07
		Aug.	29·798	0·650	86·8	46·7	40·1	73·9	52·9	21·0	61·8	54·0	·418	4·6	1·5	76	528	84·9	—	1·9	5	1	9	16	—	6·2	22	2·18
ST. JOHN'S COLLEGE, BATTERSEA, REV. J. P. FAUNTHORPE, M.A., F.R.G.S.	13	July	29·841	0·731	79·0	45·0	34·0	—	—	—	—	—	—	—	—	—	—	100·6	45·0	1·6	2	3	15	11	—	5·3	8	2·13
		Aug.	29·868	0·654	87·0	44·0	43·0	73·5	51·9	21·6	61·4	60·0	·517	5·7	0·3	93	520	99·8	45·2	1·8	0	1	16	14	—	6·1	15	2·42
		Sept.	29·928	1·264	74·0	37·0	37·0	64·4	43·9	20·5	53·8	52·2	·391	4·4	0·2	94	539	84·6	38·7	1·3	3	5	10	12	—	5·3	8	2·01
CAMDEN TOWN (London), G. J. SYMONS, Esq., F.M.S.	123	July	29·836	0·746	90·1	45·8	44·3	76·1	54·1	22·0	63·4	53·4	·403	4·5	1·9	72	528	123·3	51·0	—	3	1	12	15	—	5·4	12	1·81
		Aug.	29·813	0·594	86·4	47·7	38·7	73·9	54·6	19·3	62·6	54·5	·425	4·7	1·6	81	528	119·3	51·2	—	3	1	7	20	—	5·5	16	2·87
		Sept.	29·850	1·249	72·0	40·3	31·7	64·9	46·3	18·6	54·5	48·0	·322	3·7	1·1	76	537	105·0	41·8	—	9	4	2	15	—	4·9	11	2·46
CHISWICK (London), THISELTON DYER, Esq.	25	July	29·929	0·786	89·5	43·5	46·0	74·9	52·3	22·6	62·6	56·7	·461	5·1	1·2	81	529	138·5	48·3	—	2	3	15	11	—	—	11	2·65
		Sept.	29·933	1·253	73·5	35·5	38·0	65·6	44·2	21·4	53·8	47·9	·332	3·7	0·9	80	539	110·6	40·2	—	6	6	9	9	—	—	12	2·32
OXFORD (Oxfordshire), REV. R. MAIN, M.A., F.R.S., F.R.A.S.	210	July	29·729	0·667	87·9	45·6	42·3	72·7	53·2	19·5	62·8	54·4	·423	4·7	1·6	74	526	125·2	48·9	0·9	1	2	14	14	2·1	6·6	15	2·26
		Aug.	29·699	0·745	82·0	46·4	35·6	70·8	54·5	16·3	62·0	53·8	·416	4·6	1·6	75	526	125·0	50·6	1·1	2	2	10	17	2·6	7·9	20	2·61
		Sept.	29·738	1·304	68·4	34·9	33·5	62·5	46·0	16·5	54·2	48·1	·334	3·8	0·9	79	535	102·2	42·7	1·0	6	4	9	11	2·4	6·4	14	1·82
GLOUCESTER (Gloucester), E. TOLLER, Esq., M.D.	100	July	29·884	0·739	91·7	48·5	43·2	73·6	54·6	19·0	63·1	53·0	·402	4·5	2·0	70	529	117·4	52·5	0·6	4	1	11	15	0·9	5·5	13	2·46
		Aug.	29·865	0·729	79·7	48·0	31·7	73·4	56·1	17·3	63·8	55·3	·437	4·8	1·9	71	527	114·1	54·6	0·7	5	1	10	15	1·1	6·7	16	2·17
		Sept.	29·901	1·334	73·9	32·1	41·8	65·4	46·6	18·8	54·9	51·1	·367	4·2	0·7	87	539	96·8	46·0	0·5	7	4	7	12	0·7	5·1	11	1·07
ROYSTON (Hertfordshire), HALE WORTHAM, Esq., F.R.A.S., F.M.S.	269	July	29·697	0·838	93·5	45·1	48·4	76·5	51·5	25·0	62·2	54·2	·422	4·7	1·6	78	526	—	—	—	—	—	—	—	—	5·3	7	1·45
		Aug.	29·662	0·690	85·9	46·0	39·9	74·4	52·5	21·9	61·1	54·6	·426	4·8	1·3	79	526	—	—	—	1	2	9	10	—	6·1	16	2·94
		Sept.	29·694	1·314	74·0	34·4	39·6	65·3	45·4	19·9	53·8	48·7	·337	3·8	0·8	81	536	—	—	—	—	—	—	—	—	6·0	12	1·90
CARDINGTON (near Bedford), Mr. MACLAREN, Assistant to S. C. WHITBREAD, Esq., F.R.S.	100	July	29·840	0·733	88·4	42·0	46·4	75·2	52·9	22·3	63·2	56·8	·462	5·1	1·2	81	527	114·7	45·6	1·0	3	1	12	15	—	4·4	—	—
		Aug.	29·810	0·720	83·4	45·4	38·0	73·4	52·8	20·6	61·7	56·6	·458	5·0	1·1	84	528	110·1	46·7	1·0	5	3	7	16	—	6·0	16	2·20
		Sept.	29·841	1·308	70·0	32·4	37·6	63·6	44·5	19·1	53·2	50·4	·366	4·1	0·4	90	538	92·5	36·3	0·8	7	3	8	12	—	4·2	12	1·90
ST. DAVID'S COLLEGE, LAMPETER (Cardiganshire), PROF. A. W. SCOTT.	420	July	29·465	0·631	89·5	41·0	48·5	69·0	47·1	21·9	57·6	52·1	·391	4·3	0·8	82	527	112·5	—	0·4	1	0	19	11	—	7·2	16	2·79
		Aug.	29·430	0·797	75·0	39·0	36·0	66·8	45·4	21·4	57·1	52·5	·395	4·4	0·9	84	527	110·1	—	0·6	0	0	20	11	—	7·7	18	3·91
		Sept.	29·551	1·188	74·5	32·2	42·3	64·9	41·3	23·6	53·1	45·9	·308	3·4	1·0	76	533	92·0	—	0·5	3	1	11	15	—	6·0	17	2·16
SOMERLEYTON RECTORY (Suffolk), REV. C. J. STEWARD, F.M.S.	50	July	29·892	0·590	86·8	42·3	44·5	74·7	52·4	22·3	62·1	56·7	·461	5·1	1·1	83	529	—	42·1	1·0	3	3	12	13	5·8	4·0	13	1·96
		Aug.	29·853	0·647	84·7	40·3	44·4	73·9	52·7	21·2	61·8	55·5	·441	4·9	1·3	88	529	—	43·6	1·0	4	3	10	14	6·3	4·9	9	1·53
		Sept.	29·894	1·304	73·8	35·3	38·5	65·1	44·2	20·9	54·0	49·8	·357	4·1	0·6	86	538	—	36·6	1·0	6	5	9	10	7·0	5·3	13	2·33

BATTERSEA.—Barometer readings are too low in each month.

LAMPETER.—Barometer readings in September too high by about 0·1 inch.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat°. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
NORWICH (Norfolk), C. M. Gibson, Esq., F.M.S.	42	July	29·886	0·645	92·0	45·0	47·0	74·1	53·3	20·8	62·6	58·0	·482	5·3	1·0	85	528	–	–	–	1	6	11	13	–	–	10	1·98
		Aug.	29·885	0·689	82·5	46·5	36·0	71·2	52·9	18·3	60·8	54·5	·431	4·9	1·1	82	531	–	–	–	1	4	12	14	–	–	12	1·81
		Sept.	29·879	1·316	70·0	36·0	34·0	62·1	45·1	17·0	53·0	50·8	·371	4·2	0·4	92	539	–	–	–	7	3	8	12	–	–	12	3·09
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	July	29·909	0·702	88·4	44·6	43·8	75·8	53·2	22·6	63·7	56·7	·462	5·1	1·5	76	528	127·4	46·8	0·5	1	3	14	13	3·0	5·5	12	2·51
		Aug.	29·876	0·772	82·7	46·0	36·7	72·5	53·4	19·1	61·7	54·4	·425	4·7	1·5	76	527	122·8	49·7	0·7	1	5	12	13	3·3	6·1	13	4·02
		Sept.	29·911	1·338	72·8	36·1	36·7	64·3	45·4	18·9	53·8	50·0	·360	4·1	0·6	86	538	111·3	41·2	0·6	4	4	8	14	3·1	5·3	12	1·87
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	July	29·773	0·650	93·0	48·4	44·6	70·4	54·4	16·0	60·7	53·1	·403	4·5	1·4	76	529	–	–	0·6	3	1	8	19	–	6·0	15	2·28
		Aug.	29·751	0·847	76·0	49·6	26·4	68·2	54·3	13·9	60·1	53·7	·413	4·6	1·2	80	529	–	–	0·7	2	2	6	21	–	7·0	18	2·44
		Sept.	29·815	1·303	75·5	41·0	34·5	62·5	48·8	13·7	54·8	47·3	·325	3·7	1·0	75	536	–	–	0·7	9	4	4	13	–	5·4	16	2·65
DERBY (Derbyshire), John Davis, Esq.	174	July	29·716	0·671	88·0	46·0	42·0	71·1	54·4	16·7	61·3	54·3	·421	4·7	1·4	78	527	119·0	–	–	3	1	13	14	–	–	15	2·14
		Aug.	29·688	0·806	78·0	47·0	31·0	68·1	54·4	13·7	59·8	53·1	·403	4·5	1·3	79	528	116·0	–	–	2	2	10	17	–	–	23	2·92
		Sept.	29·730	1·345	70·0	35·0	35·0	61·3	45·8	15·5	52·4	49·4	·354	4·0	0·5	89	537	104·2	–	–	5	3	7	15	–	–	14	1·58
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	183	July	29·636	0·552	90·4	44·1	46·3	72·2	52·6	19·6	61·1	51·9	·387	4·3	1·7	72	527	134·1	45·6	0·8	2	0	9	20	3·0	5·5	18	2·80
		Aug.	29·612	0·675	81·2	45·4	35·8	70·2	52·5	17·7	59·9	51·4	·381	4·3	1·5	74	528	124·8	44·9	0·7	3	2	8	18	2·0	6·7	23	2·68
		Sept.	29·645	1·346	73·1	30·1	43·0	63·1	43·8	19·3	52·8	46·9	·314	3·6	1·0	79	538	106·5	36·9	0·5	5	4	6	15	1·4	6·0	19	1·59
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	July	28·876	0·737	85·2	44·8	40·4	72·2	53·3	18·9	62·2	52·7	·400	4·4	1·8	72	529	145·5	46·8	1·4	2	1	17	10	–	5·8	11	2·11
		Aug.	29·842	0·714	84·2	43·5	40·7	70·3	52·2	18·1	60·4	50·3	·365	4·1	1·8	69	531	136·8	47·1	1·6	3	2	13	13	–	6·0	11	1·75
		Sept.	29·884	1·349	71·5	30·5	41·0	63·8	44·1	19·7	53·2	47·6	·330	3·7	0·9	82	539	117·4	40·4	1·4	7	2	10	11	–	5·2	12	2·75
HAWARDEN (Flint), T. Moffat, Esq., M.D., F.R.A.S.	270	July	29·588	0·645	89·5	49·0	40·5	69·1	56·7	12·4	60·9	55·5	·441	5·0	1·1	83	525	128·9	39·2	2·3	1	1	15	14	0·8	6·8	18	1·48
		Aug.	29·573	0·785	78·0	50·0	28·0	67·1	56·7	10·4	60·4	54·3	·425	4·7	1·2	81	522	124·5	38·8	2·4	6	2	11	12	1·1	7·0	22	3·27
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	July	29·710	0·581	89·1	46·9	42·2	68·9	54·4	14·5	60·2	51·0	·375	4·2	1·7	72	529	–	–	1·2	2	4	11	14	–	6·0	17	2·91
		Aug.	29·688	0·780	75·5	48·5	27·0	65·3	54·5	10·8	58·2	52·3	·393	4·4	1·1	81	530	–	–	1·3	2	5	7	17	–	6·9	26	2·76
		Sept.	29·734	1·279	70·8	41·0	29·8	60·2	48·6	11·6	53·3	46·9	·320	3·6	1·0	79	536	–	–	1·3	5	7	8	10	–	5·2	19	3·54
ECCLES (near Manchester), T. Mackereth, Esq., F.R.A.S., F.M.S.	145	July	29·741	0·735	91·5	43·4	48·1	70·3	52·3	18·0	60·3	52·8	·400	4·6	1·4	76	529	85·8	44·9	0·2	2	0	12	17	1·2	6·1	19	4·32
		Aug.	29·709	0·729	77·5	46·4	31·1	67·5	52·3	15·2	58·7	51·0	·366	4·1	1·4	74	530	80·7	45·1	0·3	5	3	9	14	2·4	7·6	28	4·15
		Sept.	29·761	1·185	74·8	31·7	43·1	62·3	44·7	17·6	52·6	46·2	·313	3·6	1·0	79	538	73·7	33·9	0·4	6	3	7	14	1·6	5·1	20	2·31
MOOR SIDE OBSERVATORY, HALIFAX (Yorkshire), Louis J. Crossley, Esq., F.M.S.	429	July	29·390	0·628	88·3	45·5	42·8	69·2	52·2	17·0	59·9	50·7	·372	4·1	1·7	71	523	107·5	46·9	–	3	2	10	16	3·2	6·7	17	2·91
		Aug.	29·376	0·751	73·4	46·2	27·2	65·0	52·3	12·7	56·6	53·5	·415	4·6	0·5	90	519	160·7	47·6	–	–	–	–	–	4·0	8·0	25	2·72
		Sept.	29·416	1·302	70·6	32·5	38·1	59·7	44·6	15·1	51·2	46·7	·321	3·6	0·5	83	533	91·8	39·0	–	7	4	3	16	2·0	6·2	15	2·27
BERMERSIDE OBSERVATORY, (Halifax), Edward Crossley, Esq., F.R.A.S.	520	Aug.	29·316	0·826	75·0	45·0	30·0	66·5	50·5	16·0	56·6	51·2	·377	4·2	0·9	82	525	109·3	47·7	0·7	2	4	10	15	–	7·9	23	3·34
		Sept.	29·330	1·509	73·0	31·5	41·5	60·4	43·6	16·8	51·0	46·7	·321	3·6	0·6	85	531	99·2	39·2	0·8	4	3	6	17	–	6·3	16	2·46
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	July	29·880	0·791	84·0	44·0	40·0	73·2	53·3	19·9	61·8	56·5	·457	5·0	1·2	83	529	102·9	50·1	–	–	–	–	–	1·9	–	16	3·52
		Aug.	29·831	0·687	77·0	43·0	34·0	68·7	52·4	16·3	59·5	53·6	·430	4·9	0·8	87	531	97·7	49·8	–	–	–	–	–	2·2	–	14	3·10
		Sept.	29·899	1·383	70·0	28·0	42·0	61·4	44·6	16·8	52·5	47·5	·329	3·7	0·7	83	540	86·5	41·3	–	–	–	–	–	1·8	–	12	0·22
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	363	July	29·501	0·698	88·2	43·9	44·3	68·9	51·7	17·2	58·7	55·0	·455	4·8	0·7	88	526	126·7	46·4	–	2	1	12	16	–	7·8	27	4·81
		Aug.	29·464	0·719	71·8	44·4	27·4	65·9	51·6	14·3	58·2	53·8	·416	4·6	0·8	85	533	119·3	47·4	–	2	4	7	18	–	8·2	29	6·38
		Sept.	29·516	1·309	70·4	32·0	38·4	60·8	44·8	16·0	52·6	47·3	·326	3·7	0·8	82	541	115·2	40·3	–	4	4	9	13	–	6·3	25	2·82
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	July	29·493	0·574	88·8	49·2	39·6	71·2	55·0	16·2	61·4	51·9	·387	4·3	1·8	72	523	92·9	–	–	–	–	–	–	–	4·1	14	2·26
		Aug.	29·429	0·779	79·5	49·0	30·5	67·7	54·8	12·9	59·2	55·8	·445	5·0	0·8	89	524	91·5	–	–	–	–	–	–	–	5·8	16	2·03
		Sept.	29·508	1·310	72·4	36·6	35·8	61·7	46·2	15·5	52·0	48·2	·338	3·8	0·6	87	534	85·0	–	–	–	–	–	–	–	5·0	13	1·32
LEEDS PHILOSOPHICAL HALL (Yorkshire)	[illegible]	July	29·740	0·581	96·0	47·0	49·0	74·8	55·2	19·6	64·8	53·8	·416	4·6	2·2	68	524	81·1	–	1·4	4	1	8	16	–	6·1	15	2·02

Names of Stations and Observers.	Height of Stati above Sea Level.	Months.	Month. Mean.	Month. Range.	Highest.	Lowest.	Range.	Mean. Of all Highest.	Mean. Of all Lowest.	Mean. Daily Range.	Air.	Dew Point.	Elastic Force.	In a cubic foot of Air. Mean.	In a cubic foot of Air. Short of Saturation.	Mean Degree of H dity. Satn. = 10	Mean Weight o cubic foot of Air.	Thermometer. Maximum in Rays of Sun.	Thermometer. Minimum on Grass.	Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount Ozone.	Mean Amount Cloud.	Number of Days it fell.	Amount col-lected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
ALLENHEADS (Northumberland), Mr. S. Stobbs, Assistant to W. B. Beaumont, Esq., M.P.	1360	July	28·424	0·514	84·5	43·5	41·0	68·4	50·4	18·0	57·5	48·8	·344	3·8	1·6	70	508	120·8	46·8	1·3	–	–	–	–	–	3·6	17	2·34
		Aug.	28·344	0·628	67·0	42·0	25·0	63·0	49·4	13·6	54·1	46·6	·316	3·6	1·1	75	512	108·4	46·4	1·8	–	–	–	–	–	6·0	23	4·05
		Sept.	28·377	1·173	69·5	33·0	36·5	57·9	41·7	16·2	48·5	43·7	·285	3·2	0·4	84	517	97·1	37·9	1·9	–	–	–	–	–	4·8	16	3·11
SILLOTH RECTORY (Cumberland), Rev. Francis Redford, M.A., F.R.A.S., F.M.S.	28	July	29·793	0·676	88·0	44·0	44·0	72·1	52·6	19·5	60·5	54·0	·417	4·7	1·2	80	530	108·0	48·4	1·3	1	2	13	15	7·0	6·3	23	3·93
		Aug.	29·764	0·712	74·3	46·0	28·3	69·0	52·8	16·2	59·6	52·8	·400	4·5	1·2	79	530	103·9	48·7	1·5	0	3	8	20	9·3	6·6	21	4·76
		Sept.	29·826	1·293	74·0	34·0	40·0	65·0	45·5	19·5	54·4	45·6	·304	3·5	1·4	77	538	101·6	40·8	1·1	4	8	3	15	7·0	4·8	15	2·36
CARLISLE (Cumberland), J. Cartmell, Esq., F.M.S.	114	July	29·737	0·856	95·0	41·5	53·5	70·2	51·4	18·8	59·5	54·0	·418	4·7	1·0	83	529	105·1	46·9	1·8	3	2	10	16	5·7	6·9	19	5·09
		Aug.	29·702	0·757	74·7	42·8	31·9	66·4	50·9	15·5	58·4	52·3	·393	4·4	1·0	80	530	95·2	47·1	2·4	3	5	6	17	6·0	7·1	25	4·35
		Sept.	29·756	1·202	75·8	31·6	44·2	61·4	43·5	17·9	52·6	46·6	·319	3·6	0·9	80	538	86·1	37·7	1·8	4	4	5	17	5·7	5·4	17	2·57
BYWELL (Northumberland), Mr. John Dawson, Assistant to W. B. Beaumont, Esq., M.P.	87	July	29·714	0·531	88·0	49·0	39·0	71·1	56·5	14·6	61·1	49·9	·359	4·0	2·0	68	528	102·0	50·0	1·1	3	5	7	16	–	3·4	17	2·22
		Aug.	29·680	0·436	77·0	48·0	29·0	68·1	55·2	12·9	60·0	50·6	·369	4·1	1·7	71	530	99·8	55·2	1·4	–	–	–	–	–	4·3	27	2·49
		Sept.	29·726	1·228	76·0	34·0	42·0	62·9	46·7	16·2	53·2	45·8	·309	3·5	1·1	76	536	76·8	39·2	1·3	7	4	3	16	–	4·1	18	2·19
NORTH SHIELDS (Northumberland), Robert Spence, Esq.,	124	July	29·748	0·625	75·6	46·2	29·4	67·3	53·6	13·7	59·3	50·4	·367	4·1	1·5	73	530	–	52·0	1·8	5	2	7	17	–	5·4	16	2·27
		Aug.	29·739	0·678	72·0	45·0	27·0	64·1	52·6	11·5	56·8	49·2	·350	4·0	1·2	76	533	–	50·9	1·8	6	2	5	18	–	6·4	24	3·47
		Sept.	29·778	1·137	68·0	37·2	30·8	58·9	46·6	12·3	51·6	45·0	·300	3·4	0·9	78	539	–	44·7	4·6	11	2	3	14	–	4·6	15	2·16
MILTOWN (Banbridge, Ireland), John Smyth, Esq., jun., M.A., M.I.C.E.I.	200	July	29·570	0·565	76·0	43·0	33·0	66·5	51·7	14·8	57·5	51·0	·374	4·2	1·1	79	528	115·1	48·4	2·3	3	2	20	6	–	5·0	27	4·13
		Aug.	29·889	0·748	71·0	46·0	25·0	63·9	51·7	12·2	57·3	52·0	·388	4·3	0·9	82	529	105·0	49·3	2·3	2	5	12	12	–	5·9	28	4·41
		Sept.	29·672	1·189	69·0	32·0	37·0	60·0	44·5	15·5	52·8	46·5	·318	3·6	0·9	80	536	103·4	40·4	1·9	6	4	9	11	–	3·6	13	2·68

Note.—*The Barometer Reading*, Bradford, September 15th, 3h. p.m., 29·944 in. has been altered to 28·944 in.

Gloucester.—From August 15th to September 6th no thermometric observations; values not included in quarterly mean.

Bywell.—August. Means deduced from 14 days observations, viz., 1st to 14th. The barometric mean is 29·787 in., but the true mean for the month would be about 29·68 in., and which value has been used in forming quarterly value.

Nottingham.—The mean monthly values of barometer have been corrected by the application of −0·063 in. to reduce them to the height of 241 feet above sea level to accord with previous series. In foot note to last Quarterly Report for *additively* read *subtractively*.

Second Rain-gauges are placed—

				July.	August.	September.	Total during the Quarter.
At Eastbourne,	at the height of 160 feet	*above the sea*,	the amount collected was	1·71 inches.	— inches.	— inches.	— inches.
„ Beachy Head,	„ 515 feet	„	„	0·97 „	— „	— „	— „
„ „	„ 495 feet	„	„	1·14 „	— „	— „	— „
„ Portsmouth,	„ 20 feet	*above the ground*	„	— „	— „	— „	— „
„ Strathfield Turgiss,	„ 38 feet	„	„	1·35 „	1·22 „	1·64 „	4·21 „
„ Eccles, Manchester,	„ 34 feet	„	„	3·79 „	3·38 „	1·89 „	9·06 „
„ Carlisle,	„ 8 feet	„	„	3·60 „	2·77 „	2·31 „	8·68 „
„ Miltown, Ireland,	„ 40 feet	„	„	3·33 „	— „	2·50 „	— „
„ Radcliffe Observatory,	„ 22 feet	„	„	2·19 „	2·21 „	1·60 „	6·00 „
„ Marlborough College,	„ 8 inches	„	„	2·06 „	2·46 „	3·05 „	7·57 „
„ „	„ 1 foot	„	„	2·03 „	2·35 „	2·97 „	7·35 „
„ Cardington,	„ 36 feet	„	„	— „	2·00 „	1·65 „	— „
„ Nottingham,	„ 25½ feet	„	„	2·63 „	2·57 „	1·46 „	6·66 „
„ Wisbech,	„ 8 feet	„	„	2·47 „	4·00 „	1·89 „	8·36 „
„ Aldershot Camp,	„ 25 feet	„	„	1·52 „	1·55 „	2·11 „	5·18 „

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Mean Estimated Strength.	WIND. Relative Proportion of N.	E.	S.	W.	
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°						
Guernsey	29·586	81·0	48·5	32·5	65·2	55·7	22·5	9·5	59·5	53·9	·417	4·6	1·1	82	530	—	—	1·2	5	4	10	11	3
Helston	29·677	80·0	45·0	35·0	69·4	53·9	30·3	15·5	60·1	53·7	·414	4·8	1·1	76	529	90·5	49·9	2·2	4	4	10	12	4
Truro	29·621	81·0	40·0	41·0	66·5	53·2	34·0	13·5	58·2	51·8	·386	4·3	1·1	80	535	—	—	2·6	5	4	5	16	-
Sidmouth	29·533	77·0	43·8	33·2	65·3	52·8	26·5	12·5	58·3	54·5	·430	4·9	0·6	88	538	—	—	1·5	6	2	8	14	-
Osborne	29·585	86·7	43·6	43·1	69·7	53·9	33·7	15·8	60·1	54·2	·422	4·7	1·1	81	530	103·8	43·7	0·1	3	4	9	14	-
Bournemouth	—	78·7	41·0	37·7	66·5	54·0	41·0	12·5	59·5	51·9	·387	4·3	1·2	76	534	—	—	—	3	2	7	19	-
Worthing	29·569	77·3	43·5	33·8	67·1	54·2	26·6	12·9	60·0	53·5	·411	3·6	1·2	79	530	117·2	58·9	1·0	3	4	8	16	3
Brighton	29·597	81·0	44·0	37·0	68·0	53·8	26·8	14·1	59·9	52·1	·392	4·3	1·4	76	530	119·9	47·1	1·1	3	4	10	14	-
Lymington	29·562	82·8	40·3	42·5	68·2	52·3	34·5	15·9	59·6	51·2	·412	4·2	1·5	74	532	—	49·0	1·5	4	4	9	14	-
Taunton	29·560	95·0	36·0	59·0	69·6	50·9	44·7	18·7	59·3	52·2	·392	4·4	1·3	87	532	80·3	45·1	0·3	5	3	5	17	5
Wilton House	29·551	89·0	35·0	54·0	71·6	48·2	44·0	23·4	58·8	54·1	·420	4·7	0·9	84	530	114·7	45·8	1·3	3	3	9	15	-
Barnstaple	29·514	83·5	41·0	42·5	68·0	54·3	33·3	13·7	59·5	55·0	·437	4·8	0·8	86	532	—	—	1·2	1	4	13	12	-
Aldershot Camp	29·570	89·6	37·8	51·8	71·5	51·4	39·7	20·1	59·8	51·7	·386	4·3	1·5	75	527	119·4	49·1	1·6	4	3	10	14	-
Strathfield Turgiss	29·588	87·7	37·3	50·4	69·6	50·8	47·7	18·8	59·2	51·5	·382	4·3	1·5	75	533	125·0	45·1	0·6	4	4	7	15	5
Marlborough College	29·616	88·2	36·5	51·7	63·6	51·0	38·0	16·6	57·2	50·4	·367	4·1	1·1	78	528	130·7	45·1	—	4	2	8	17	5
Royal Observatory	29·554	88·7	38·2	50·5	72·2	51·5	48·7	20·7	60·3	52·8	·401	4·5	1·4	77	530	125·7	45·2	0·3	3	3	9	15	-
Battersea	—	87·0	37·0	50·0	—	—	38·0	—	—	—	—	—	—	—	—	95·0	43·0	1·6	2	3	14	12	-
Camden Town	29·570	90·1	40·3	49·8	71·6	51·7	38·2	19·9	60·2	52·0	·385	4·3	1·5	76	531	115·8	48·0	—	5	2	7	17	-
Oxford	29·557	87·9	34·9	53·0	68·6	51·2	37·1	17·4	59·7	52·1	·391	4·4	1·4	76	529	117·5	47·4	1·0	3	3	11	14	2
Royston	29·579	93·5	34·4	59·1	72·1	49·8	42·6	22·3	59·0	52·5	·395	4·4	1·2	79	509	—	—	—	—	—	—	—	-
Cardington	29·511	88·4	32·4	56·0	70·7	50·1	40·7	20·6	59·4	54·6	·429	4·7	0·9	85	531	105·8	42·9	0·7	5	2	9	14	-
Lampeter	—	89·5	32·2	57·3	66·9	44·6	42·3	22·3	55·9	50·2	·365	4·0	0·9	81	529	104·9	—	0·5	1	—	17	12	-
Somerleyton Rectory	29·513	86·8	35·3	51·5	71·2	49·8	42·5	21·4	59·3	54·0	·420	4·7	1·0	86	532	—	40·8	1·0	4	4	10	12	6
Norwich	29·519	92·0	36·0	56·0	69·1	50·4	39·0	18·7	58·8	54·4	·428	4·8	0·8	86	533	—	—	—	3	4	10	13	-
Wisbech	29·526	88·4	36·1	52·3	70·9	50·7	39·1	20·2	59·7	53·7	·416	4·6	1·2	79	531	120·5	45·9	0·6	2	4	11	13	3
Llandudno	29·508	93·0	41·0	52·0	67·0	52·5	35·2	14·5	58·5	51·4	·380	4·3	1·2	77	531	—	—	0·7	5	2	6	18	-
Derby	29·508	88·0	35·0	53·0	66·8	51·5	36·0	15·3	57·8	52·3	·393	4·4	1·1	82	531	113·1	—	—	3	2	10	15	-
Nottingham	29·529	90·4	30·1	60·3	68·5	49·6	41·7	18·9	57·9	50·1	·361	4·1	1·4	75	531	121·8	42·5	0·7	3	2	8	18	2
Holkham	29·867	85·2	30·5	54·7	68·8	49·9	40·7	18·9	58·6	50·2	·365	4·1	1·5	74	533	133·2	44·8	1·5	4	2	13	11	-
Liverpool	29·564	89·1	41·0	48·1	64·8	52·5	33·0	12·3	57·2	50·1	·363	4·1	1·3	77	532	—	—	1·3	3	5	9	14	-
Eccles	29·537	91·5	31·7	59·8	66·7	49·8	40·8	16·9	57·2	50·0	·360	4·1	1·3	76	532	80·1	41·3	0·3	4	2	9	15	1
Moorside	29·495	88·3	32·5	55·8	64·6	49·7	36·0	14·9	55·9	50·3	·369	4·1	0·9	82	525	100·0	44·5	—	—	—	—	—	3
Hull	29·463	84·0	28·0	56·0	67·8	50·1	38·7	17·7	57·9	53·2	·408	4·5	0·9	84	533	99·0	47·1	—	—	—	—	—	2
Stonyhurst	29·504	88·2	32·0	56·0	65·2	49·4	36·7	15·8	56·5	52·0	·399	4·3	0·8	85	537	120·4	44·7	—	3	3	9	15	-
Bradford	29·477	88·8	36·6	52·2	66·8	52·0	35·3	14·8	57·9	52·0	·390	4·3	1·1	82	527	89·8	—	—	—	—	—	—	-
Leeds	29·485	96·0	37·0	59·0	69·3	51·5	39·3	17·8	60·1	52·2	·391	4·3	1·5	76	529	77·1	—	1·3	6	3	6	15	-
Cockermouth	29·531	89·1	33·9	55·2	64·7	50·9	38·4	13·8	57·5	50·6	·370	4·1	1·1	78	529	105·3	44·4	0·5	5	3	11	11	2
Allenheads	29·468	84·5	33·0	51·5	63·1	47·2	34·2	15·9	53·4	46·4	·315	3·5	1·0	76	512	108·8	43·7	1·7	—	—	—	—	-
Silloth	29·484	88·0	34·0	54·0	68·7	50·3	37·4	18·4	58·2	50·8	·340	4·2	1·3	79	533	104·5	46·0	1·3	2	4	8	17	7
Carlisle	29·477	95·0	31·6	63·4	66·0	48·6	43·2	17·4	56·8	51·0	·377	4·2	1·0	81	532	95·5	43·9	2·0	3	4	7	17	5
Bywell	29·453	88·0	34·0	54·0	67·4	53·8	36·6	14·6	58·1	48·8	·346	3·9	2·3	73	531	92·9	41·5	1·3	—	—	—	—	-
North Shields	29·548	75·6	37·2	38·4	63·4	50·9	29·1	12·5	55·9	48·2	·339	3·8	1·2	76	534	—	49·2	2·7	7	2	5	16	-
Miltown (Ireland)	29·464	76·0	32·0	44·0	63·5	49·3	31·7	14·2	56·0	49·8	·360	4·0	1·0	80	531	107·8	46·0	2·2	4	4	14	9	-

The highest temperatures of the air were at Leeds, 96°·0; Taunton and Carlisle, 95°·0 respectively; Royston, 93°·5; Ll Norwich, 92°·0; and at Eccles, 91°·5.

The lowest temperatures of the air were at Hull, 28°·0; Nottingham, 30°·1; Carlisle, 31°·6; Eccles, 31°·7; Stonyhur 32°·0 respectively; Cardington, 32°·4; Moorside, 32°·5; Allenheads, 33°·0; and at Cockermouth, 33°·9.

The greatest daily ranges of the temperatures of the air were at Wilton House, 23°·4; Royston, 22°·3; Somerleyto Observatory, 20°·7; Cardington, 20°·6; and at Wisbech, 20°·2.

The least daily ranges of the temperatures of the air were at Guernsey, 9°·5; Liverpool, 12°·3; Sidmouth, Bournem Shields, 12°·5 respectively; and at Worthing, 12°·9.

The greatest numbers of rainy days were at Stonyhurst, 81; Miltown, 68; Eccles, 67; Barnstaple, 65; Liverpool and spectively; Truro and Carlisle, 61 respectively; Nottingham, 60; and at Silloth, 59.

The least numbers of rainy days were at Lymington, 27; Royal Observatory, 33; Norwich, 34; Worthing, Royston, a 35 respectively; and at Strathfield Turgiss and Wisbech, 37 respectively.

The heaviest falls of rain were at Barnstaple, 14·85 inches; Stonyhurst, 14·01 inches; Carlisle, 12·01 inches; Miltown Cockermouth, 11·23 inches; Silloth, 11·05 inches; Helston, 11·02 inches; Eccles, 10·78 inches; and at Guernsey, 10·77 inch

The least falls of rain were at Strathfield Turgiss, 5·70 inches; Somerleyton, 5·82 inches; Worthing, 5·91 inches; 6·04 inches; Osborne, 6·06 inches; Leeds, 6·21 inches; Royston, 6·29 inches; and at Bradford, 6·51 inches.

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Mean Estimated Strength.	WIND. Relative Proportion of N.	E.	S.	W.	
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°						
Guernsey	29·586	81·0	48·5	32·5	65·2	55·7	22·5	9·5	59·5	53·9	·417	4·6	1·1	82	530	—	—	1·2	5	4	10	11	3
Between the latitudes 50° and 51°	29·595	80·6	42·6	38·0	67·6	53·5	31·7	14·1	59·5	52·9	·407	4·4	1·1	79	532	107·8	49·7	1·4	4	4	8	15	4
51° and 52°	29·564	88·8	37·4	51·4	69·9	51·2	41·3	18·7	59·3	52·4	·396	4·4	1·2	79	530	103·2	46·4	0·9	4	3	9	15	4
52° and 53°	29·532	90·0	35·8	54·2	69·7	50·7	39·3	19·0	58·9	53·5	·409	4·6	1·1	82	528	113·1	43·2	0·7	4	3	9	15	4
53° and 54°	29·504	89·4	34·1	55·3	66·4	50·7	37·1	15·7	57·5	51·4	·383	4·2	1·1	80	531	94·4	44·4	0·9	4	3	9	14	2
54° and 55°	29·483	88·9	33·3	55·6	66·0	50·2	37·9	15·8	56·8	49·5	·350	4·0	1·3	77	525	101·2	43·9	1·3	3	4	9	15	5
North Shields	29·548	75·6	37·2	38·4	63·4	50·9	29·1	12·5	55·9	48·2	·339	3·8	1·2	76	534	—	49·2	2·7	7	2	5	16	-
Miltown, Banbridge (Ireland)	29·464	76·0	32·0	44·0	63·5	49·3	31·7	14·2	56·0	49·8	·360	4·0	1·0	80	531	107·8	46·0	2·2	4	4	14	9	-
Mean for the Quarter, 50° to 55° Year 1870	29·619	86·1	37·2	48·9	70·1	51·3	33·5	18·8	59·6	52·0	·390	4·3	1·4	76	531	108·5	44·6	1·0	8	6	6	11	3
" 1871	29·517	84·5	36·9	47·6	67·0	50·2	37·0	16·8	58·9	52·2	·394	4·4	1·2	79	530	108·7	46·6	1·0	5	6	8	12	4
" 1872	29·489	85·2	34·3	50·9	68·9	52·2	41·4	16·7	58·8	52·7	·403	4·5	1·2	79	529	108·7	46·4	1·1	6	5	8	12	3
" 1873	29·536	87·5	36·6	50·9	67·9	51·3	37·5	16·6	58·4	51·9	·389	4·3	1·2	79	529	103·9	45·5	1·0	4	3	9	15	[illegible]

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING DECEMBER 31, 1873.

:MARKS ON THE WEATHER DURING THE QUARTER ENDING DECEMBER 31ST, 1873.

By JAMES GLAISHER, ESQ., F.R.S., *&c.*

Till the 7th day of October there was an excess of mean temperature of the average amount of ' daily ; the 8th and 9th days were cold, and the 10th and 11th were warm, the deficiency of aperature of the first two of these four days being $7\frac{3}{4}°$, and the excess in the last two being the same amount, viz., $7\frac{3}{4}°$. A lengthened cold period followed of more than a month's duration, tending from October 12th to November 16th, and the average daily deficiency of mean temperae was $3\frac{1}{4}°$; then from November 17th to December 7th the weather was mostly warm, and the excess daily mean temperature was 3°·1. A week of very severe cold weather ensued, the deficiency of aperature on the 9th, 10th, and 11th being $11\frac{1}{2}°$, $16\frac{1}{2}°$, and $12\frac{1}{2}°$ respectively; and these days in ndon were distinguished by a most remarkable continuance of very dense fog. The fog of the ı was darker in colour and more dense than I have ever known a fog or cloud to be before.

In the seven days ending with the 14th the average daily deficiency was $8\frac{3}{4}°$. A warm period n set in, and continued with slight exception to the end of the year; some of the days were very rm, particularly the 16th, 17th, and 18th, when the daily temperatures were 10°·8, 10°·0, and °·6 in excess over their respective averages. The mean temperature of these three days was higher than that of the three days a week before, viz., the 9th, 10th, and 11th. The mean ess of daily temperature above their averages for the last 17 days of the year was as large as $4\frac{1}{2}°$.

The mean temperature for the month of October at Greenwich was 6°·9 below that of September; t of November was 3°·6 below that of October; and that of December was 3°·6 below that of rember. The mean decrease from all stations from September to October was 6°·4; and from ober to November was 3°·6. In December at several northern stations it was warmer, by from o 2° than in November, whilst it was colder at all southern stations to the amount of 3° or 4°.

The readings of the barometer at 159 feet above the sea level were very variable during the early : of October, but the movements were not of any great magnitude, and the departures on er side of the average of the mean daily values rarely exceeded one or two tenths of an ı. On the 19th readings slightly exceeding 30 in. were registered, but on this day a fall set in, continued during the 20th, 21st, and 22d, reaching its minimum (about 28·8 in.) about noon the 23d. On the 29th, 30·1 in. was recorded, but by the 1st November the reading had decreased 29·0 in. The range of reading during October amounted to 1·56 in.

A general increase was experienced till the 17th November, the mean readings for the 16th 17th being half an inch in excess of the average, but during the remainder of the month several res of high and low values occurred, a general tendency, however, being shown to decrease. the 1st December the readings passed above 30 in., and till the 14th continued with but very exceptions in excess of 30·3 in., and for some days even in excess of 30·4 in. The departures he mean daily values for this period above the average were as follows: 1st, 0·59 in.; 2d, 0·62 in.; 0·68 in.; 4th, 0·66 in.; 5th, 0·48 in.; 6th, 0·54 in.; 7th, 0·64 in.; 8th, 0·66 in.; 9th, 0·62 in.; h, 0·61 in.; 11th, 0·66 in.; 12th, 0·67 in.; 13th, 0·64 in.; and 14th, 0·46 in. From the 15th vards many oscillations occurred, but with very few exceptions the readings remained above ·6 in. The range of reading during December amounted to 1·07 in.

The mean decrease of readings of the barometer from all stations from September to October s 0·112 in.; from October to November there was a decrease at southern stations, and an rease at northern; from November to December there was an increase everywhere, to the erage amount of 0·355 in.

Rain fell almost daily in October from the 7th to the 13th and from the 19th to the 24th; and November to the 10th day, and occasionally after the 18th. In December till the middle of the nth there was no rain, and only a few slight showers fell subsequently, the total fall in the onth being only 0·3 inch, and less than in any December back to 1829, when it was 0·1 inch; is is the only instance back to 1815 of a smaller fall than in the present December. The fall of in over the whole country in these three months was but little more than one half of the fall in e same months in the year 1872.

The average duration of the different directions of the wind referred to eight points of the mpass, and the duration of each direction in each month in the quarter, were as follows :—

Direction	OCTOBER.		NOVEMBER.		DECEMBER.	
		Departure		Departure		Departure

field Turgiss, Weybridge Heath, and Oxford; on the 13th at Truro; and on the 29th at By
On the 5th of November at Helston and Stonyhurst; on the 8th at Brighton; and on the 30t
Oxford and Halifax. On the 2d and 26th of December at Liverpool; on the 27th and 28t
Bywell; on the 29th at Weybridge Heath, Oxford, Halifax, and Bywell; and on the 30t
Brighton and Bywell.

Auroræ Boreales were seen, on the 12th of October at Silloth; on the 13th at Hull; and o
15th at Halifax (faintly). On the 12th and 13th of November at Hull. On the 19th of Dece
at Carlisle.

Hazel divested of leaves, on the 12th of November at Hull.

Walnut divested of leaves, on the 7th of November at Weybridge Heath; and on the 11th at Hull.

Snowdrop in blossom, on the 31st of December at Helston.

Swallow departed, on the 4th of October from Hull; on the 5th from Brighton; on the 9th from Helston; and on the 20th from Weybridge Heath. On the 22d of November from Osborne. (Was seen) on the *5th and 8th of* November at Weybridge Heath.

Redwing arrived, on the 11th of November at Stonyhurst.

Woodcock arrived, on the 12th of October at Helston; on the 20th at Guernsey; and on t
th at Hull.

The mean temperature of December was $40°\cdot6$, being $1°\cdot5$ higher than the average of the preceding 102 years, lower than in 1871 by $2°\cdot3$, but higher than in 1871 by $2°\cdot3$, in 1870 by $7°\cdot0$, and in 1869 by $2°\cdot7$ respectively.

. *The mean high day temperatures* were higher than their respective averages in November and December, but lower in October.

The mean low night temperatures were lower than their respective averages in October and December, but higher in November.

Therefore the days and nights of October were cold, and those of November warm, while the days of December were warm and the nights cold.

The daily ranges of temperature were greater than their respective averages in October and December by $1°\cdot6$ and $1°\cdot1$ respectively, but less in November by $0°\cdot4$.

The fall of rain was 0·2 in. and 1·7 in. in defect in October and December respectively, but $0°\cdot3$ in. in excess in November.

1873. Months.	Temperature of										Elastic Force of Vapour.		Weight of Vapour in a Cubic Foot of Air.	
	Air.			Evaporation.		Dew Point.		Air—Daily Range.		Water of the Thames.				
	Mean.	Diff. from average of 102 years.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.		Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
Oct. -	47·8	−1·8	−2·4	46·1	−2·2	44·2	−1·9	16·4	+1·6	53·6	0·290	−0·024	3·3	−0·3
Nov. -	44·2	+1·9	+0·6	42·4	+1·0	40·3	+0·8	11·3	−0·4	44·3	0·250	+0·003	2·9	+0·1
Dec. -	40·6	+1·5	+0·3	39·3	+0·5	37·6	+0·6	10·5	+1·1	43·2	0·225	+0·003	2·6	0·0
Means -	44·2	+0·5	−0·5	42·6	−0·2	40·7	−0·2	12·7	+0·8	47·0	0·255	−0·006	2·9	−0·1

1873. Months.	Degree of Humidity.		Reading of Barometer.		Weight of a Cubic Foot of Air.		Rain.		Daily Horizontal movement of the Air.	Reading of Thermometer on Grass.				
										Number of Nights it was			Lowest Reading at Night.	Highest Reading at Night.
	Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.	Amount.	Diff. from average of 58 years.		At or below 30°.	Between 30° and 40°.	Above 40°.		
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
Oct. -	88	+ 1	29·685	−0·014	542	+3	2·6	−0·2	237	10	11	10	20·0	48·1
Nov. -	86	− 2	29·708	−0·047	546	−2	2·6	+0·3	296	6	21	3	19·0	44·9
Dec. -	90	+ 2	30·107	+0·310	558	+6	0·3	−1·7	247	17	12	2	13·9	43·8
Means -	88	0	29·833	+0·083	549	+2	Sum 5·5	Sum −1·6	Mean 260	Sum 33	Sum 44	Sum 15	Lowest 13·9	Highest 48·1

NOTE.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the plus sign (+) signifies above the average.

The mean temperature of the air in the three months ending November, constituting the three autumn months, was $48°\cdot9$, being $0°\cdot6$ lower than the average of the preceding 102 years.

Thunderstorms occurred, on the 7th of October at Cockermouth and Silloth; on the 8th at Brighton, Royston, and Cardington; on the 10th at Llandudno; on the 12th at Bywell and North Shields; on the 13th at Truro; on the 22d at Helston, Liverpool, Eccles, Halifax, Cockermouth, and Carlisle; on the 23d at Guernsey, Brighton, Oxford, Liverpool, and Silloth; on the 24th at Guernsey, Osborne, Taunton, Stonyhurst, and Carlisle; on the 25th at Guernsey and Stonyhurst. On the 3d of November at Hull; on the 4th at Guernsey; on the 7th at Osborne and Weybridge Heath; and on the 26th at Guernsey, Helston, Truro, and Osborne.

Thunder was heard, but lightning was not seen, on the 8th of October at Eccles; on the 14th at Halifax; on the 23d at Helston. On the 1st of November at Cockermouth; and on the 7th at Truro and Salisbury.

Lightning was seen, but thunder was not heard, on the 3d of October at Royston; on the 8th at Osborne, Cardington, Somerleyton, Liverpool, and Hull; on the 9th at Hull; on the 12th at Cockermouth and Carlisle; on the 13th at Wisbech, Liverpool, Eccles, and Hull; on the 14th at Hull; on the 21st at Carlisle; on the 22d at Halifax, Hull, Stonyhurst, and North Shields; on the 23d at Truro, Lymington, Weybridge Heath, Somerleyton, Llandudno, and Cockermouth; on the 24th at Brighton, Salisbury, Weybridge Heath, Llandudno, Cockermouth, Allenheads, Silloth, and Carlisle; on the 25th at Lymington, Aldershot Camp, Weybridge Heath, Oxford, Cockermouth, and Silloth; on the 26th at Aldershot Camp and Wisbech; on the 27th at Aldershot Camp; and on the 29th at Hull. On the 1st of November at Stonyhurst; on the 4th at Oxford; on the 6th at Gloucester; on the 7th at Brighton; on the 8th at Truro; and on the 23d at Brighton.

Solar halos were seen, on the 2d of October at Oxford; on the 5th at Brighton and Oxford; on the 8th at Oxford; on the 9th at Strathfield Turgiss; and on the 24th at Oxford. On the 14th of November at London. On the 16th of December at Halifax; and on the 20th at Truro.

Lunar halos were seen, on the 1st and 3d of October at Oxford; on the 5th at Brighton, Strathfield Turgiss, Weybridge Heath, and Oxford; on the 13th at Truro; and on the 29th at Bywell. On the 5th of November at Helston and Stonyhurst; on the 8th at Brighton; and on the 30th at Oxford and Halifax. On the 2d and 26th of December at Liverpool; on the 27th and 28th at Bywell; on the 29th at Weybridge Heath, Oxford, Halifax, and Bywell; and on the 30th at Brighton and Bywell.

Auroræ Boreales were seen, on the 12th of October at Silloth; on the 13th at Hull; and on the 15th at Halifax (faintly). On the 12th and 13th of November at Hull. On the 19th of December at Carlisle.

w fell, on the 13th of October on the surrounding hills of Carlisle; on the 20th and 22d at heads; on the 23d at Halifax and Stonyhurst; on the 24th at Stonyhurst; and on the 26th enheads. On the 27th of December at Aldershot Camp and Strathfield Turgiss.

l fell, on the 7th of October at Cockermouth; on the 8th at Guernsey, Helston, Truro, ley, Llandudno, and Allenheads; on the 11th at Cockermouth; on the 13th at Llandudno, rmouth, and Silloth; on the 14th at Llandudno and Stonyhurst; on the 20th at Llandudno, den, Liverpool, Halifax, and Stonyhurst; on the 22d at Helston, Llandudno, Halifax, hurst, and Carlisle; on the 23d at Guernsey, Helston, Truro, Oxford, Royston, Llandudno, , Halifax, Stonyhurst, and Cockermouth; on the 24th at Guernsey, Helston, Truro, and on; and on the 25th at Guernsey and Truro. On the 1st of November at Guernsey, e, Llandudno, Stonyhurst, Cockermouth, and Silloth; on the 2d at Helston, Brighton, rmouth, and Silloth; on the 3d at Hull; on the 16th and 26th at Guernsey; on the 27th at on and Halifax; and on the 29th at Guernsey and Halifax. On the 22d of December at x and Stonyhurst; and on the 31st at Stonyhurst.

prevailed, on the 1st of October at Lymington, Aldershot Camp, Somerleyton, and York; 2d at Lymington, Aldershot Camp, and Weybridge Heath; on the 3d at Bournemouth, n, Bradford, Allenheads, and North Shields; on the 6th at Allenheads; on the 8th at l; on the 9th at London, Hull, and York; on the 12th at Lymington, Oxford, and Eccles; 13th at Oxford, Cardington, Wisbech, Silloth, Carlisle, and Bywell; on the 14th at London xford; on the 15th at Lymington, Taunton, London, Eccles, and York; on the 16th at gton, London, Oxford, Cardington, Hull, and Bradford; on the 17th at London and Oxford; 18th at Eccles; on the 19th at Bournemouth, Lymington, Weybridge Heath, London, and .; on the 24th at London, Oxford, and North Shields; on the 25th at Lymington, Aldershot Weybridge Heath, London, Oxford, and Cardington; on the 26th at Lymington, Taunton, n, and Oxford; on the 27th at Oxford, Norwich, and Eccles; on the 28th at Taunton, ey, Oxford, Cardington, and Norwich; on the 29th at Taunton, Weybridge Heath, Streatley, n, Oxford, Cardington, Norwich, and Wisbech; and on the 30th at Streatley, London, Oxford, gton, and Bradford. On the 3d of November at Taunton, London, Oxford, Cardington, , Halifax, Bradford, and North Shields; on the 4th at Taunton, Eccles, Halifax, and Bradon the 5th at London, Llandudno, and Bywell; on the 6th at Llandudno, Bywell, and North ; on the 7th at Weybridge Heath, London, Oxford, and Somerleyton; on the 8th at idge Heath and London; on the 9th at Weybridge Heath; on the 10th at London; on the London and Liverpool; on the 12th at London, Norwich, and Liverpool; on the 13th at hot Camp, Oxford, Cardington, Norwich, Liverpool, and Eccles; on the 14th at Aldershot London, Norwich, and Llandudno; on the 16th at Oxford; on the 17th at London, Oxford, andudno; on the 18th at Oxford, Royston, Llandudno, and Miltown; on the 19th at London, , Norwich, Llandudno, North Shields, and Miltown; on the 20th at Oxford and Gloucester; 21st at Taunton; on the 24th at Guernsey and Oxford; on the 25th at Guernsey, Helston, n, London, and North Shields; on the 26th at Helston; and on the 30th at Oxford. On of December at Taunton, Oxford, and Somerleyton; on the 2d and 3d at Oxford; on the Oxford and Somerleyton; on the 5th at Guernsey; on the 6th at Truro, Oxford, and ool; on the 7th at Truro, Taunton, and Oxford; on the 8th and 9th at Taunton and Oxford; 10th at Taunton, Oxford, and Hull; on the 11th at Bournemouth, Taunton, Salisbury, hot Camp, Marlborough, Streatley, Oxford, Somerleyton, Norwich, Liverpool, Hull, and rd; on the 12th at Bournemouth, Taunton, Aldershot Camp, Weybridge Heath, Marlborough, ey, Oxford, Cardington, Liverpool, Eccles, Hull, and Bradford; on the 13th at Taunton, rough, Streatley, Somerleyton, Eccles, Halifax, and Hull; on the 14th at Marlborough rdington; on the 15th at Taunton; on the 18th at Guernsey; on the 19th at Guernsey arlborough; on the 24th at Bournemouth and Oxford; on the 25th at Osborne, Taunton, , and Somerleyton; on the 26th at Taunton; and on the 28th at Osborne, Bournemouth, ry, Weybridge Heath, Oxford, Royston, Cardington, and Somerleyton.

l Elm divested of leaves, on the 7th of November at Hull; on the 21st at Oxford and idge Heath; and on the 25th at Guernsey.

h Elm divested of leaves, on the 4th of November at Hull; and on the 25th at Llandudno.

divested of leaves, on the 20th of November at Guernsey; and on the 30th at Hull.

divested of leaves, on the 31st of October at Oxford and Guernsey. On the 2d of November and Llandudno; and on the 12th at Weybridge Heath.

more divested of leaves, on the 30th of October at Helston; and on the 31st at Guernsey. On of November at Llandudno; on the 10th at Hull and Helston; and on the 14th at Weybridge Heath.

echestnut divested of leaves, on the 30th of October at Hull; and on the 31st at Guernsey, , and Weybridge Heath. On the 2d of November at Weybridge Heath; on the 9th at dno; and on the 29th at Helston.

non Poplar divested of leaves, on the 27th of October at Helston. On the 14th of ber at Hull; on the 15th at Llandudno; and on the 19th at Helston.

dental Plane divested of Leaves, on the 21st of November at Hull.

ntal Plane divested of leaves, on the 17th of November at Hull.

thorn divested of leaves, on the 14th of November at Helston; on the 15th at Llandudno; 19th at Hull; and on the 20th at Weybridge Heath.

l divested of leaves, on the 12th of November at Hull.

nut divested of leaves, on the 7th of November at Weybridge Heath; and on the 11th at Hull.

drop in blossom, on the 31st of December at Helston.

llow departed, on the 4th of October from Hull; on the 5th from Brighton; on the 9th from ; and on the 20th from Weybridge Heath. On the 22d of November from Osborne. (Was n the 5th and 8th of November at Weybridge Heath.

ing arrived, on the 11th of November at Stonyhurst.

cock arrived, on the 12th of October at Helston; on the 20th at Guernsey; and on the *Hull.*

D 2

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING DECEMBER 31ST, 1873.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S., F.M.S.	204	Oct.	29·679	1·387	68·5	39·0	29·5	58·1	48·7	9·4	52·8	48·6	·344	3·9	0·6	86	536	—	—	1·2	6	5	9	11	4·1	5·8	18	2·51
		Nov.	29·646	1·084	56·0	39·5	16·5	52·2	45·4	6·8	48·7	44·5	·296	3·2	0·6	86	540	—	—	1·8	7	7	9	7	4·5	6·7	18	5·87
		Dec.	30·088	0·962	53·5	32·0	21·5	49·4	41·6	7·8	45·6	41·7	·265	3·0	0·4	87	552	—	—	0·9	5	8	10	8	3·5	6·0	12	1·05
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	106	Oct.	29·896	1·450	70·0	28·0	42·0	60·1	50·0	10·1	53·8	44·6	·295	3·4	1·5	69	536	75·2	61·7	1·9	9	3	9	10	4·8	4·9	23	3·61
		Nov.	29·863	1·274	58·0	38·0	20·0	53·6	46·6	7·0	50·5	42·7	·274	3·3	0·9	77	541	58·4	41·1	2·2	9	8	5	8	5·3	7·4	21	4·31
		Dec.	30·297	1·097	57·0	33·0	24·0	53·6	43·8	9·8	49·1	42·8	·275	3·4	0·9	80	550	58·2	39·0	1·4	4	5	11	11	3·7	6·3	10	1·04
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	Oct.	29·860	1·453	72·0	26·0	46·0	57·7	44·5	13·2	50·0	45·7	·307	3·5	0·6	85	542	—	—	2·1	9	1	9	12	—	6·4	23	3·34
		Nov.	29·827	1·234	56·0	31·0	25·0	51·6	43·5	8·1	47·1	41·8	·265	3·1	0·6	83	545	—	—	2·7	6	9	5	10	—	7·4	23	4·05
		Dec.	30·205	1·055	54·0	25·0	29·0	50·9	39·0	11·9	45·6	41·1	·259	3·0	0·6	85	554	—	—	1·8	6	4	8	13	—	7·6	18	1·23
SIDMOUTH (Devon), J. Ingleby Mackenzie, Esq., M.B., F.M.S.	30	Oct.	29·866	1·534	69·3	30·1	39·2	57·4	43·4	14·0	49·7	48·2	·339	3·9	0·2	95	542	—	—	0·9	9	5	5	12	—	3·0	14	1·89
		Nov.	29·840	1·280	57·1	31·0	26·1	50·9	42·0	8·9	46·1	44·0	·288	3·3	0·3	93	546	—	—	1·5	5	12	3	10	—	4·3	14	4·16
		Dec.	30·279	1·050	56·7	27·0	29·7	48·8	38·8	10·0	44·3	43·0	·276	3·2	0·3	98	556	—	—	0·6	11	3	3	14	—	4·4	6	0·81
OSBORNE (Isle of Wight), J. B. Mann, Esq.	172	Oct.	29·690	1·440	72·6	30·3	42·3	58·1	44·1	14·0	50·1	47·8	·333	3·8	0·3	92	539	79·8	33·2	0·1	8	3	9	11	—	6·2	16	3·71
		Nov.	29·690	1·225	56·8	31·1	25·7	51·1	41·3	9·8	45·9	42·3	·270	3·1	0·5	87	544	63·2	30·9	0·3	7	7	7	9	—	8·0	16	2·00
		Dec.	30·115	1·040	53·9	26·3	27·6	47·6	37·6	10·0	42·8	40·6	·254	3·0	0·2	92	555	54·9	26·8	0·4	6	4	11	10	—	7·4	12	0·74
BOURNEMOUTH (Hants), T. A. Compton, Esq., M.D., B.A., F.M.S.	128	Oct.	29·893	1·520	65·2	28·7	36·5	55·9	45·1	10·8	49·3	45·1	·301	3·5	0·6	86	544	—	—	—	13	2	7	9	—	8·7	16	3·02
		Nov.	29·908	1·120	56·3	32·1	24·2	49·9	41·5	8·4	45·5	41·6	·263	3·0	0·5	87	549	—	—	—	12	4	4	10	—	5·5	17	3·35
		Dec.	30·310	1·000	54·2	24·9	29·3	47·3	38·2	9·1	42·8	39·7	·243	2·9	0·4	89	559	—	—	—	9	3	4	15	—	5·3	10	0·80
PORTSMOUTH, William C. Ellis, Esq.	16	Aug.	29·915	0·725	85·0	45·3	39·7	74·6	53·8	20·8	62·8	53·8	·415	4·6	1·8	73	529	119·2	51·3	1·4	0	4	14	13	2·3	5·5	14	2·50
		Oct.	29·705	1·558	73·2	37·0	36·2	63·4	47·0	16·4	53·7	48·3	·338	3·8	0·8	82	535	89·9	45·0	1·2	4	3	12	12	1·2	6·9	21	4·78
		Nov.	29·827	1·262	61·2	32·2	29·0	54·2	41·2	13·0	48·3	42·7	·275	3·2	0·8	80	547	69·8	39·0	1·6	7	9	6	9	1·3	6·8	18	2·58
		Dec.	30·277	1·006	56·2	24·0	32·2	50·2	37·0	13·2	44·0	39·6	·244	2·8	0·5	83	557	59·1	35·0	1·0	7	5	7	12	0·6	7·0	7	0·65
BRIGHTON (Sussex), Frederick E. Sawyer, Esq., F.M.S.	200	Oct.	29·664	1·512	68·5	32·1	36·4	55·8	44·4	11·4	49·6	46·5	·317	3·6	0·4	90	539	92·6	39·1	0·9	7	2	8	14	—	7·1	20	4·45
		Nov.	29·662	1·042	55·8	32·7	23·1	50·3	41·3	9·0	45·6	41·7	·264	3·1	0·5	88	544	78·2	35·9	1·1	8	7	6	9	—	7·8	16	2·75
		Dec.	30·085	1·122	52·7	26·3	26·4	46·1	37·7	8·4	42·4	38·9	·237	2·7	0·4	88	555	68·5	32·4	0·8	8	4	7	12	—	7·2	10	0·65
LYMINGTON (Hants), George J. Jones, Esq.	77	Oct.	29·807	1·519	70·5	28·4	42·1	57·7	43·0	14·7	49·9	45·4	·304	3·5	0·6	86	541	—	39·6	1·1	9	7	6	9	—	5·8	14	3·82
		Nov.	29·795	1·239	57·3	30·1	27·2	51·5	41·6	9·9	46·1	41·8	·266	3·1	0·5	86	546	—	38·2	2·1	5	10	7	8	—	7·9	14	3·11
		Dec.	30·200	1·041	55·5	24·0	31·5	48·2	37·7	10·5	42·8	39·2	·240	2·8	0·4	88	557	—	33·0	0·9	6	5	8	12	—	6·7	6	0·85
TAUNTON (Somerset), James Bottomley, Esq.	80	Oct.	29·783	1·577	76·5	24·5	52·0	57·4	40·2	17·2	48·1	46·2	·313	3·5	0·3	94	543	65·5	37·8	0·1	6	4	7	14	1·6	6·7	18	2·13
		Nov.	29·790	1·301	58·0	27·7	30·3	50·3	39·5	10·8	44·8	41·3	·260	3·0	0·4	88	547	54·3	36·9	0·4	5	9	6	10	3·2	7·9	14	2·70
		Dec.	30·214	1·014	55·5	18·5	37·0	47·4	35·4	12·0	42·0	39·8	·245	2·8	0·3	92	558	50·8	31·6	0·2	15	0	0	16	2·0	7·0	5	0·44
WILTON HOUSE (near Salisbury), T. Challis, Esq.	186	Oct.	29·698	1·378	71·0	20·5	50·5	58·8	37·6	21·2	47·1	42·9	·278	3·2	0·5	87	543	91·9	34·8	1·3	9	5	7	10	—	6·0	13	1·98
		Nov.	29·652	1·277	57·0	23·0	34·0	50·8	36·5	14·3	43·8	40·9	·257	3·0	0·3	90	546	71·9	33·8	1·6	3	13	4	10	—	7·7	15	3·39
		Dec.	30·085	1·086	56·0	17·0	39·0	48·2	32·3	15·9	40·4	37·4	·224	2·6	0·4	90	558	64·8	29·6	1·1	8	6	5	12	—	7·0	7	0·94
BARNSTAPLE (Devon), T. Mackrell, Esq.	43	Oct.	29·820	1·580	72·0	29·0	43·0	57·7	45·4	12·3	50·6	48·0	·335	3·8	0·3	91	541	—	—	1·2	3	7	11	10	—	6·0	19	4·40
		Nov.	29·825	1·296	57·0	33·0	24·0	50·7	42·0	8·7	46·2	42·6	·274	3·2	0·5	88	546	—	—	1·2	2	8	11	9	—	6·1	22	2·34
		Dec.	30·240	1·070	55·5	28·0	27·5	48·5	39·8	8·7	44·6	42·2	·269	3·1	0·5	88	555	—	—	1·3	4	6	11	10	—	6·2	18	1·45

Names of Stations and Observers.	Height of Station above Sea Level.	1873. Months.	Atmosphere in Month. Mean.	Range.	Highest.	Lowest.	Range.	Mean Of all Highest.	Of all Lowest.	Daily Range.	Air.	Dew Point.	Elastic Force.	In a Cubic foot of Air. Mean.	Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of cubic foot of Air.	Reading of Thermometer. Maximum in Rays of Sun.	Minimum on Grass.	Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
ALDERSHOT CAMP (Hants), JOHN ARNOLD, Esq., M.S.C., F.M.S.	325	Oct.	29·495	1·522	74·6	23·0	51·6	57·0	41·0	16·0	48·0	44·6	·294	3·4	0·4	89	538	85·4	38·6	1·8	6	3	11	11	2·1	7·2	16	2·70
		Nov.	29·509	1·254	56·2	28·2	28·0	49·9	37·3	12·6	43·4	40·0	·247	2·9	0·4	87	544	69·1	35·3	1·6	7	9	7	7	1·6	7·5	14	2·49
		Dec.	29·905	1·046	54·8	15·4	39·4	45·9	34·1	11·8	40·2	37·5	·224	2·2	0·4	90	551	61·5	31·0	1·2	3	1	16	11	1·5	8·0	9	0·68
STRATHFIELD TURGISS (Hants), REV. C. H. GRIFFITH, M.A., F.M.S.	197	Oct.	29·663	1·502	71·8	23·4	48·4	56·0	39·7	16·3	47·5	44·6	·295	3·3	0·4	90	541	92·6	36·6	0·4	7	6	6	12	3·5	6·5	16	2·49
		Nov.	29·671	1·288	56·8	28·0	28·8	49·5	38·4	11·1	44·0	39·4	·212	2·8	0·5	84	546	72·8	33·7	0·6	5	12	5	8	3·9	6·9	12	2·37
		Dec.	30·089	1·070	57·3	17·4	39·9	45·7	34·2	11·5	40·4	37·5	·225	2·6	0·3	90	558	67·2	32·1	0·5	5	5	5	16	4·0	8·0	6	0·61
WEYBRIDGE HEATH (Surrey), WILLIAM F. HARRISON, Esq., F.M.S.	150	Oct.	29·700	1·311	74·0	25·0	49·0	56·7	40·2	16·5	47·4	43·2	·280	3·2	0·3	86	543	82·8	37·8	0·4	5	4	14	8	0·5	6·7	15	3·22
		Nov.	29·752	1·285	57·0	21·0	36·0	49·3	38·7	10·6	43·5	40·0	·218	2·8	0·3	89	548	63·0	33·3	0·7	7	8	10	5	0·7	6·9	13	2·19
		Dec.	30·144	1·063	55·5	16·5	39·0	44·7	35·8	8·9	39·9	36·6	·216	2·5	0·4	88	559	50·4	33·4	0·5	2	8	15	6	0·8	7·0	8	0·58
MARLBOROUGH COLLEGE (Wilts), REV. THOMAS A. PRESTON, M.A., F.M.S.	456	Oct.	29·389	1·550	69·7	20·4	49·3	55·4	37·8	17·6	45·8	43·5	·283	3·2	0·3	92	538	93·8	36·4	—	6	7	10	8	3·2	7·3	15	2·63
		Nov.	29·401	1·277	57·3	23·4	33·9	48·9	36·7	12·2	42·6	38·9	·237	2·7	0·4	87	542	67·6	34·8	—	5	12	6	7	—	8·2	17	3·31
		Dec.	29·808	1·109	59·2	15·8	43·4	45·4	33·2	12·2	39·7	37·7	·226	2·6	0·3	92	554	57·9	32·7	—	6	5	8	12	—	8·2	9	0·60
ROYAL OBSERVATORY (Kent), THE ASTRONOMER ROYAL.	159	Oct.	29·685	1·561	75·1	26·7	48·4	57·0	40·6	16·4	47·8	44·2	·290	3·3	0·5	88	542	85·5	35·2	0·3	5	4	10	12	—	6·9	14	2·55
		Nov.	29·708	1·295	57·0	25·8	31·2	50·1	38·8	11·3	41·2	40·3	·250	2·9	0·5	86	546	69·6	33·7	0·5	5	10	7	8	—	7·4	15	2·58
		Dec.	30·107	1·070	56·3	21·1	35·2	45·6	35·2	10·4	40·6	37·6	·225	2·6	0·4	90	558	58·2	28·8	0·3	2	3	9	17	—	7·2	6	0·31
STREATLEY VICARAGE (Berks), REV. J. SLATTER, M.A., F.R.A.S., F.M.S.	150	Oct.	29·719	1·503	72·8	23·3	49·5	57·5	39·2	18·3	47·0	43·4	·282	3·3	0·4	88	543	63·6	—	1·0	6	4	9	12	—	6·0	14	2·39
		Dec.	30·154	1·093	53·7	17·8	37·9	45·5	35·4	10·1	40·8	37·4	·223	2·6	0·4	88	558	49·8	—	0·8	4	2	10	15	—	7·2	6	0·46
ST. JOHN'S COLLEGE, BATTERSEA, REV. J. P. FAUNTHORPE, M.A., F.R.G.S.	13	Oct.	29·817	1·558	78·0	51·0	27·0	57·2	37·5	19·7	48·0	45·8	·308	3·5	0·3	91	514	70·7	35·0	1·3	7	4	9	11	—	6·1	15	2·86
		Nov.	29·864	1·338	57·4	25·2	32·2	50·3	35·9	14·4	44·0	42·2	·270	3·1	0·2	91	549	57·8	31·5	1·4	6	11	8	5	—	6·6	10	2·05
CAMDEN TOWN (London), G. J. SYMONS, Esq., F.M.S.	123	Oct.	29·745	1·300	73·4	26·2	47·2	57·0	40·4	16·6	48·2	43·8	·286	3·3	0·5	85	512	74·9	36·8	—	9	1	2	19	—	6·4	15	2·97
		Nov.	29·749	1·275	58·1	27·7	30·4	50·1	38·8	11·3	41·6	40·3	·250	2·9	0·5	85	546	58·0	34·6	—	10	8	3	9	—	6·8	11	1·87
		Dec.	30·144	1·089	56·7	22·9	33·8	45·8	35·8	10·0	41·0	37·4	·223	2·6	0·4	87	558	48·1	33·6	—	6	4	4	17	—	7·2	8	0·48
CHISWICK (London), THISELTON DYER, Esq.	25	Oct.	29·836	1·550	—	—	—	—	—	—	48·0	44·4	·293	3·4	0·5	89	541	—	—	—	—	—	—	—	—	—	16	2·96
		Nov.	29·833	1·312	58·6	24·9	33·7	50·9	39·0	11·9	44·4	40·7	·254	2·9	0·4	87	548	67·7	36·9	—	8	7	9	6	—	—	15	2·12
OXFORD (Oxfordshire), REV. R. MAIN, M.A., F.R.S., F.R.A.S.	210	Oct.	29·628	1·591	71·7	23·0	48·7	53·3	40·5	14·8	47·9	43·5	·282	3·2	0·6	85	541	93·8	37·8	0·7	7	3	10	11	1·2	6·9	15	2·09
		Nov.	29·671	1·287	58·9	27·8	31·1	49·4	38·8	10·6	44·2	39·4	·242	2·8	0·5	83	546	75·0	36·4	1·0	6	10	7	7	1·2	8·3	11	1·70
		Dec.	30·047	1·095	57·9	20·1	37·8	45·2	36·1	9·1	40·6	37·0	·219	2·5	0·4	87	556	61·8	33·9	0·6	2	4	13	12	0·9	8·1	9	0·51
GLOUCESTER (Gloucester), E. TOLLER, Esq., M.D.	100	Oct.	29·707	1·550	70·0	23·3	46·7	53·9	40·4	15·5	—	—	—	—	—	—	—	79·3	—	0·6	9	4	6	12	0·2	5·6	14	2·10
		Nov.	29·866	1·285	59·2	27·4	31·8	48·8	38·6	10·2	43·6	39·0	·238	2·7	0·5	84	550	59·1	37·2	1·0	8	8	8	6	1·2	7·2	12	1·32
		Dec.	30·216	1·200	58·7	11·1	47·6	45·9	34·2	11·7	40·6	37·4	·223	2·6	0·4	89	560	54·8	34·1	0·6	3	3	13	12	0·1	5·7	7	0·59
ROYSTON (Hertfordshire), HALE WORTHAM, Esq., F.R.A.S., F.M.S.	269	Oct.	29·564	1·511	72·9	23·6	49·3	56·4	39·9	16·5	47·0	42·8	·275	3·2	0·5	86	540	—	—	—	—	—	—	—	—	5·7	15	2·94
		Nov.	29·621	1·316	56·8	22·9	33·9	49·4	37·1	12·3	43·3	40·0	·246	2·8	0·4	87	546	—	—	—	—	—	—	—	—	6·8	17	1·97
		Dec.	29·983	1·046	57·2	20·6	36·6	46·1	34·4	11·7	40·5	37·3	·222	2·6	0·4	89	556	—	—	—	—	—	—	—	—	6·7	7	0·50
CARDINGTON (near Bedford), MR. MACLAREN, Assistant to S. C. WHITBREAD, Esq., F.R.S.	105	Oct.	29·743	1·580	72·0	23·0	49·0	56·4	38·9	17·5	46·8	43·0	·277	3·1	0·5	87	544	70·2	31·5	0·8	5	3	10	14	—	5·8	10	2·15
		Nov.	29·790	1·344	57·0	26·6	30·4	49·4	37·3	12·1	43·0	40·4	·251	2·9	0·3	90	549	53·9	30·8	0·9	7	10	5	8	—	7·0	12	2·00
		Dec.	30·165	1·100	57·6	20·0	37·6	45·5	33·7	11·8	40·0	37·7	·226	2·6	0·3	92	559	45·5	26·1	0·5	1	2	7	21	—	6·3	7	0·45
ST. DAVID'S COLLEGE, LAMPETER (Cardiganshire), PROF. A. W. SCOTT.	420	Oct.	29·448	1·549	67·0	19·5	47·5	57·2	38·7	18·5	46·6	44·7	·297	3·4	0·3	94	538	78·5	—	—	5	6	10	10	—	—	19	3·77
		Nov.	29·446	1·338	55·0	26·0	29·0	48·4	37·2	11·2	42·3	37·9	·228	2·6	0·5	85	543	61·8	—	—	6	12	6	6	—	—	13	2·47
SOMERLEYTON RECTORY (Suffolk), REV. C. J. STEWARD, F.M.S.	50	Oct.	29·758	1·603	72·0	29·1	42·9	57·6	41·2	16·4	48·7	46·6	·319	3·6	0·3	93	542	—	32·3	0·6	9	3	9	11	6·6	5·0	17	2·19
		Nov.	29·826	1·518	56·6	28·6	28·0	51·2	38·3	12·9	44·7	41·0	·257	2·9	0·5	86	548	—	30·1	1·0	5	9	8	8	6·8	5·6	15	0·83
		Dec.	30·204	1·122	57·0	20·6	36·4	45·8	34·5	11·3	40·5	38·7	·235	2·7	0·2	94	560	—	25·1	0·9	4	1	13	13	5·6	6·0	13	0·69

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1873. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean. Of all Highest.	Temperature of Air in Month. Mean. Of all Lowest.	Temperature of Air in Month. Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. E.	Wind. S.	Wind. W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
NORWICH (Norfolk), C. M. Gibson, Esq., F.M.S.	42	Oct.	29·781	1·608	69·5	27·5	42·0	54·5	40·3	14·2	47·1	45·2	·302	3·4	0·3	94	544	—	—	—	6	2	11	12	—	—	12	1·94
		Nov.	29·830	1·344	55·0	28·5	26·5	48·3	37·7	10·6	43·1	40·9	·256	2·9	0·3	92	550	—	—	—	7	9	7	7	—	—	11	1·07
		Dec.	30·200	1·106	56·0	22·0	34·0	45·2	34·0	11·2	40·3	38·7	·235	2·8	0·2	94	560	—	—	—	3	1	13	14	—	—	7	0·43
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	Oct.	29·810	1·582	71·1	25·7	45·4	55·6	40·1	15·5	46·6	—	—	—	—	—	—	87·3	35·4	0·4	5	0	13	13	2·3	6·5	17	2·39
		Nov.	29·851	1·372	55·1	31·0	24·1	49·1	38·9	10·2	43·5	—	—	—	—	—	—	69·5	33·1	0·5	7	7	7	9	2·3	6·8	12	1·42
		Dec.	30·225	1·112	56·3	23·5	32·8	45·8	35·6	10·2	40·5	—	—	—	—	—	—	61·2	30·9	0·3	2	1	15	13	2·1	6·3	7	0·55
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	Oct.	29·687	1·625	67·4	33·0	34·4	56·2	44·0	12·2	49·8	43·6	·285	3·3	0·8	80	539	—	—	0·7	4	4	7	16	—	6·1	21	3·98
		Nov.	29·771	1·535	57·5	31·0	26·5	48·7	40·4	8·3	44·6	39·6	·244	2·8	0·6	83	547	—	—	1·0	2	11	7	10	—	7·5	13	1·68
		Dec.	30·076	1·370	55·4	30·0	25·4	49·3	40·5	8·8	45·5	40·8	·254	2·9	0·5	84	552	—	—	0·7	1	0	4	26	—	6·3	12	1·44
DERBY (Derbyshire), John Davis, Esq.	174	Oct.	29·625	1·577	67·0	26·0	41·0	53·9	39·7	14·2	46·1	43·6	·284	3·3	0·4	92	542	—	—	—	6	2	9	14	—	—	13	2·40
		Nov.	29·672	1·429	56·0	32·0	24·0	48·6	39·2	9·4	43·6	39·0	·239	2·7	0·5	84	546	—	—	—	7	8	5	10	—	—	19	2·03
		Dec.	30·021	1·155	56·0	21·0	35·0	45·6	36·0	9·6	41·1	38·2	·230	2·6	0·6	89	555	—	—	—	2	1	9	19	—	—	7	0·26
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	183	Oct.	29·555	1·546	69·1	24·2	44·9	55·4	37·9	17·5	45·7	41·6	·264	3·0	0·6	86	543	77·9	33·2	0·6	5	3	7	16	1·1	6·4	22	1·35
		Nov.	29·586	1·452	57·6	30·2	27·4	48·7	37·9	10·8	43·1	39·6	·243	2·8	0·4	88	546	60·4	32·3	1·0	7	8	7	8	2·6	7·5	21	2·36
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	Oct.	29·780	1·512	71·2	21·8	49·4	56·2	39·0	17·2	47·8	42·4	·273	3·1	0·6	83	543	92·0	35·0	1·3	4	3	14	10	—	6·6	13	2·04
		Nov.	29·822	1·396	55·2	23·0	32·2	49·8	36·8	13·0	43·8	39·1	·237	2·7	0·5	83	549	68·6	30·6	1·3	7	8	10	5	—	6·5	12	1·15
		Dec.	30·176	1·136	57·0	22·0	35·0	46·1	33·7	12·4	40·6	37·0	·220	2·6	0·4	86	559	49·5	29·3	1·3	2	0	17	12	—	6·4	8	0·54
HAWARDEN (Flint), T. Moffat, Esq., M.D., F.R.A.S.	270	Oct.	29·504	1·577	67·0	32·0	35·0	53·5	43·5	10·0	47·4	44·9	·298	3·4	0·4	92	539	79·3	28·9	1·7	4	1	12	14	0·7	6·4	21	2·56
		Nov.	29·572	1·503	56·0	30·0	26·0	47·2	39·4	7·8	42·9	40·5	·253	3·0	0·2	91	545	56·5	25·2	1·1	6	6	10	8	0·9	7·6	16	2·01
		Dec.	29·913	1·172	57·0	25·0	32·0	46·6	39·3	7·3	43·2	40·2	·249	2·8	0·4	88	551	50·7	22·1	1·6	3	0	14	14	0·6	5·9	13	0·89
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	Oct.	29·622	1·576	68·0	33·5	34·5	54·2	43·8	10·4	48·0	43·1	·278	3·2	0·6	84	540	—	—	1·1	4	4	11	12	—	6·3	21	3·17
		Nov.	29·691	1·533	55·2	32·8	22·4	47·6	39·6	8·0	43·1	38·1	·229	2·6	0·6	82	547	—	—	1·4	4	13	6	7	—	7·0	17	1·97
		Dec.	29·984	1·234	56·7	24·5	32·2	47·4	39·2	8·2	43·4	39·0	·238	2·8	0·4	84	553	—	—	1·1	1	5	13	12	—	6·6	12	0·84
ECCLES (near Manchester), T. Mackereth, Esq., F.R.A.S., F.M.S.	145	Oct.	29·650	1·720	68·4	27·2	41·2	55·3	40·1	15·2	46·8	42·6	·273	3·1	0·6	86	542	63·3	33·2	0·3	5	3	10	13	1·5	5·6	21	4·59
		Nov.	29·709	1·546	55·2	28·2	27·0	48·8	38·3	10·5	43·5	38·9	·237	2·7	0·5	85	547	52·3	31·1	0·5	7	10	6	7	3·1	7·2	18	2·27
		Dec.	30·032	1·206	57·7	21·7	36·0	46·6	36·2	10·4	41·9	38·1	·230	2·7	0·4	87	556	48·6	29·6	0·4	3	0	12	16	2·0	7·3	16	0·77
MOOR SIDE OBSERVATORY, HALIFAX (Yorkshire), Louis J. Crossley, Esq., F.M.S.	429	Oct.	29·287	1·572	67·1	29·6	37·5	52·6	39·4	13·2	45·4	42·8	·275	3·1	0·4	91	537	70·8	34·0	—	6	4	5	16	1·6	7·2	16	3·48
		Nov.	29·367	1·541	55·0	28·3	26·7	46·8	38·6	8·2	42·2	38·7	·235	2·7	0·4	88	542	53·2	35·1	—	7	12	4	7	2·8	8·2	16	3·27
		Dec.	29·682	1·142	55·0	25·0	30·0	45·9	37·0	8·9	41·7	38·6	·235	2·7	0·4	89	548	51·1	32·6	—	3	2	6	20	3·0	7·6	10	0·92
BERMERSIDE OBSERVATORY, (Halifax), Edward Crossley, Esq., F.R.A.S.	520	Oct.	29·205	1·515	68·8	29·0	39·8	52·3	39·4	12·9	46·0	43·0	·278	3·3	0·4	90	535	81·9	32·6	0·7	3	2	7	19	—	6·9	18	3·29
		Nov.	29·300	1·567	54·0	28·0	26·0	45·6	37·4	8·2	41·4	37·6	·226	2·6	0·4	87	542	62·1	32·6	0·8	8	8	7	7	—	8·0	17	3·40
		Dec.	29·619	1·180	52·0	23·2	28·8	44·2	36·3	7·9	40·6	36·9	·220	2·5	0·4	87	549	57·6	30·5	0·8	2	1	8	20	—	7·8	12	0·97
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	Oct.	29·787	1·638	67·0	27·0	40·0	53·7	39·0	14·7	46·2	42·8	·276	3·2	0·4	89	545	72·4	35·6	—	–	–	–	–	2·2	—	18	2·28
		Nov.	29·848	1·578	55·0	28·0	27·0	48·0	38·6	9·4	43·6	37·9	·228	2·6	0·6	80	549	57·8	35·8	—	–	–	–	–	2·2	—	13	1·65
		Dec.	30·166	1·201	53·0	25·0	28·0	44·7	34·7	10·0	40·5	35·0	·204	2·5	0·5	87	559	51·2	31·6	—	–	–	–	–	1·6	—	9	0·39
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	363	Oct.	29·398	1·583	68·0	27·0	41·0	54·2	38·8	15·4	45·6	41·7	·265	3·0	0·5	87	539	94·2	34·2	—	4	1	12	14	—	7·0	20	8·68
		Nov.	29·471	1·656	54·6	26·8	27·8	47·5	37·9	9·6	42·5	38·3	·232	2·7	0·5	86	544	73·4	33·4	—	10	9	4	7	—	7·4	22	8·87
		Dec.	29·774	1·279	51·0	24·9	26·1	45·8	37·5	8·3	41·8	38·6	·236	2·7	0·4	89	550	61·4	32·8	—	3	2	11	15	—	7·9	28	2·39
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	Oct.	29·349	1·596	68·4	32·2	36·2	54·1	40·3	13·8	46·4	41·6	·263	3·0	0·6	84	537	66·6	—	0·4	–	–	–	–	—	7·7	16	2·04
		Nov.	29·474	1·567	56·2	30·8	25·4	48·0	38·6	9·4	43·1	39·2	·239	2·8	0·5	86	543	51·9	—	0·9	–	–	–	–	—	8·6	10	2·09
		Dec.	29·744	1·210	56·2	28·0	28·2	48·3	39·0	9·3	43·9	40·8	·256	3·0	0·4	89	547	50·7	—	1·0	–	–	–	–	—	6·2	9	0·90
LEEDS PHILOSOPHICAL HALL [illegible]	[illegible]	Oct.	29·615	1·597	70·0	28·0	42·0	54·5	40·3	14·2	46·0	43·5	·283	3·2	0·5	89	541	62·2	—	1·2	9	1	4	17	—	7·5	22	1·84

Names of Stations and Observers.	Height of Station above Sea Level.	Months.	Month. Mean.	Month. Range.	Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Air.	Dew Point.	Elastic Force.	In a cubic foot of Air. Mean.	In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Sat. = 100	Mean Weight of a cubic foot of Air	Thermometer. Maximum in Rays of Sun.	Thermometer. Minimum on Grass.	Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount Ozone.	Mean Amount Cloud.	Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
ALLENHEADS (Northumberland), Mr. T. Kidd, Assistant to W. B. Beaumont, Esq., M.P.	1360	Oct.	28·260	1·426	61·3	23·5	37·8	49·9	36·7	13·2	42·4	38·5	·233	2·7	0·5	86	521	72·3	33·7	1·5	–	–	–	–	–	6·4	25	3·68
		Nov.	28·309	1·525	51·0	26·0	25·0	43·6	34·1	9·5	38·6	36·1	·213	2·5	0·3	91	526	68·1	31·5	1·5	–	–	–	–	–	7·9	19	3·51
		Dec.	28·555	1·192	52·0	21·0	31·0	45·0	33·7	11·3	39·0	36·7	·218	2·5	0·3	92	531	64·5	30·6	1·5	–	–	–	–	–	6·2	17	3·21
SILLOTH RECTORY (Cumberland), Rev. Francis Redford, M.A., F.R.A.S., F.M.S.	28	Oct.	29·693	1·621	63·0	23·4	39·6	55·2	40·1	15·1	46·9	40·5	·253	3·0	0·8	78	543	82·4	35·5	1·3	3	7	8	13	8·7	5·7	21	6·83
		Nov.	29·809	1·859	56·2	24·6	31·6	48·5	39·2	9·3	43·1	37·2	·221	2·6	0·8	80	549	66·1	32·7	1·4	6	11	4	9	9·9	6·1	14	1·61
		Dec.	30·047	1·446	52·3	24·0	28·3	48·0	39·6	8·4	44·5	38·7	·235	2·7	0·6	79	553	59·3	35·9	1·7	2	3	7	19	10·7	7·3	14	1·16
CARLISLE (Cumberland), J. Cartmell, Esq.	114	Oct.	29·621	1·598	63·1	21·3	41·8	52·7	37·4	15·3	44·5	41·4	·261	3·0	0·4	89	544	62·5	32·6	1·3	3	4	10	14	5·7	6·3	19	4·57
		Nov.	29·723	1·617	55·0	21·7	33·3	47·7	34·8	12·9	40·9	38·5	·233	2·8	0·2	91	550	56·1	30·5	1·7	4	10	7	9	4·9	6·3	13	2·01
		Dec.	29·980	1·304	54·8	22·0	32·8	47·5	37·5	10·0	42·8	39·1	·239	3·1	0·3	86	553	52·9	33·5	2·1	0	2	9	20	6·5	6·9	14	1·11
BYWELL (Northumberland), Mr. John Dawson, Assistant to W. B. Beaumont, Esq., M.P.	87	Oct.	29·590	1·564	64·0	27·0	37·0	54·3	40·4	13·9	46·2	39·6	·244	2·8	0·8	79	542	68·7	32·4	1·3	3	6	7	15	–	4·9	20	2·85
		Nov.	29·707	1·832	55·0	30·0	25·0	48·7	38·8	9·9	43·1	35·9	·211	2·5	0·7	76	548	54·8	31·5	1·3	4	7	6	13	–	5·7	19	2·07
		Dec.	29·971	1·282	56·0	29·0	27·0	48·9	39·4	9·5	44·4	37·1	·220	2·6	0·8	75	551	53·6	31·9	1·3	3	1	6	21	–	4·6	13	0·72
NORTH SHIELDS (Northumberland), Robert Spence, Esq.	124	Oct.	29·656	1·599	62·2	30·0	32·2	52·1	39·8	12·3	45·0	41·3	·260	3·0	0·4	87	544	–	37·8	1·6	12	3	3	13	–	5·5	19	2·24
		Nov.	29·746	1·774	57·5	32·0	25·5	49·3	39·5	9·8	43·5	38·5	·233	2·7	0·6	82	548	–	36·8	1·6	7	6	6	11	–	6·4	18	1·30
MILTOWN (Banbridge, Ireland), John Smyth, Esq., Jun., M.A., M.I.C.E.I.	200	Oct.	29·523	1·552	65·0	26·0	39·0	52·5	38·7	13·8	44·9	40·8	·254	2·9	0·5	86	542	82·1	33·9	1·8	4	1	16	10	–	4·7	21	2·74
		Nov.	29·626	1·630	56·0	28·0	28·0	47·6	37·3	10·3	42·3	38·1	·230	2·7	0·5	86	547	61·2	31·8	2·5	9	8	8	5	–	5·2	19	1·62
		Dec.	29·893	1·359	56·0	25·0	31·0	48·3	38·1	10·2	43·4	39·7	·244	2·8	0·4	87	551	56·8	32·8	2·0	1	2	23	5	–	4·8	16	0·65

Note.—*The Barometer Reading*, Holkham, 27th November, 3h. p.m., 30·432 in. has been altered to 29·432 in. Helston, 28th November, 3h. p.m., 29·200 in. has been altered to 30·200 in. Strathfield Turgiss, 6th December, 3h. p.m., 29·352 in. has been altered to 30·352 in. Portsmouth, 13th December, 3h. p.m., 29·654 in. has been altered to 30·054 in. Cockermouth, 24th December, 9h. a.m., 30·083 in. has been altered to 30·083 in. Allenheads, 31st December, 3h. p.m., 29·008 in. has been altered to 28·008 in.

Nottingham.—The mean monthly values of barometer have been corrected by the application of −0·063 in. to reduce them to the height of 241 feet above sea level to accord with previous series.

Taunton.—October. The mean reading of the minimum on grass is deduced from observations to the 22d. Thermometer then broken.

Gloucester.—October. Dry and wet bulb thermometer sent away for verification. In November the mean of dry and wet thermometers are deduced from the 8th onwards. (Many of the minimum radiation thermometer are higher than the minimum in air.)

Bradford.—October. Means deduced from 27 days observations. In November from 23 days observations.

Allenheads.— ,, ,, 27 ,, ,, 26 ,,

Wisbech.—The Wet bulb thermometer readings in each month are mostly higher than the Dry, and therefore cannot be used.

St. John's College, Battersea.—The readings of the wet bulb thermometer are apparently too high.

Errata.—Meteorological Table, Quarter ending 30th September 1873:—

Helston,	16th Column, *for* 90·5 *read* 93·8	Brighton,	16th Column, *for* 119·9 *read* 119·6	Cardington,	18th Column, *for* 0·7 *read* 0·9	Leeds,	24th Column, *for* 7·8 *read* 6·9
Bournemouth,	7th ,, ,, 41·0 ,, 27·7	Taunton,	14th ,, ,, 87 ,, 77	Hull,	16th ,, ,, 99·0 ,, 95·7	Silloth,	3d ,, ,, 34·0 ,, 37·4
Worthing,	2d ,, ,, 77·3 ,, 77·2	Strathfield Turgiss,	7th ,, ,, 47·7 ,, 37·7	Stonyhurst,	4th ,, ,, 56·0 ,, 56·2	Bywell,	6th ,, ,, 53·8 ,, 52·8
,,	4th ,, ,, 33·8 ,, 33·7	Marlborough College,	6th ,, ,, 51·0 ,, 50·0	,,	15th ,, ,, 537 ,, 533	,,	13th ,, ,, 2·3 ,, 1·6
,,	9th ,, ,, 60·0 ,, 59·6			,,	24th ,, ,, 7·8 ,, 7·4	,,	17th ,, ,, 41·5 ,, 46·1
,,	12th ,, ,, 3·6 ,, 4·6	Royal Observatory,	7th ,, ,, 48·7 ,, 38·7	Bradford,	9th ,, ,, 57·9 ,, 57·5	Miltown,	26th ,, ,, 11·29 ,, 11·22
,,	17th ,, ,, 58·9 ,, 48·9	Royston,	15th ,, ,, 509 ,, 529				

Second Rain-gauges are placed—

			October.		November.		December.		Total during the Quarter.
At Portsmouth,	at the height of 20 feet *above the ground*,	the amount collected was	4·64 inches.	-	2·45 inches.	-	0·61 inches.	-	7·70 inches.
,, Strathfield Turgiss,	,, 38 feet	,,	1·98 ,,	-	1·88 ,,	-	0·46 ,,	-	4·32 ,,
,, Eccles, Manchester,	,, 34 feet	,,	3·80 ,,	-	1·76 ,,	-	0·53 ,,	-	6·09 ,,
,, Carlisle,	,, 3 feet	,,	0·89 ,,	-	1·05 ,,	-	1·13 ,,	-	3·07 ,,
,, Miltown, Ireland,	,, 40 feet	,,	2·57 ,,	-	1·62 ,,	-	0·55 ,,	-	4·74 ,,
,, Oxford,	,, 22 feet	,,	2·55 ,,	-	1·58 ,,	-	0·50 ,,	-	4·63 ,,
,, Marlborough College,	,, 8 inches	,,	2·55 ,,	-	3·25 ,,	-	0·58 ,,	-	6·38 ,,
,, ,, ,,	,, 1 foot	,,	2·53 ,,	-	3·18 ,,	-	0·55 ,,	-	6·26 ,,
,, Cardington,	,, 36 feet	,,	1·90 ,,	-	1·75 ,,	-	0·38 ,,	-	4·03 ,,
,, Nottingham,	,, 39 feet	,,	1·1[illegible]	-	2·12	-	—	-	—

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	WIND. Mean Estimated Strength.	WIND. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°							
Guernsey	29·726	68·5	32·0	36·5	53·2	45·2	22·5	8·0	49·0	44·7	·302	3·4	0·5	86	543	—	—	1·3	6	7	9	9	4·0	6·2
Helston	—	70·0	28·0	42·0	55·8	46·8	28·7	9·0	51·1	48·4	·281	3·4	1·1	75	542	63·9	47·3	1·8	7	5	8	10	4·6	6·2
Truro	29·734	72·0	25·0	47·0	53·1	42·3	33·3	11·1	47·6	42·9	·277	3·2	0·6	84	547	—	—	2·2	7	5	7	12	—	7·1
Sidmouth	29·727	69·3	27·0	42·3	52·3	41·3	31·7	11·0	46·7	45·1	·301	3·5	0·3	91	548	—	—	1·0	8	7	4	12	—	3·9
Osborne	29·737	72·3	23·8	48·3	52·3	41·0	31·9	11·3	46·3	43·6	·286	3·3	0·3	90	546	66·0	30·3	0·3	7	5	9	10	—	7·2
Bournemouth	—	65·2	24·9	40·3	51·0	41·6	30·0	9·4	47·9	42·1	·259	3·1	0·5	87	551	—	—	—	11	3	5	11	—	4·6
Brighton	29·752	68·5	26·3	42·2	50·7	41·1	28·6	9·6	45·9	42·4	·273	3·1	0·4	89	546	79·8	35·8	0·9	8	4	7	12	—	7·4
Taunton	29·745	76·5	18·5	58·0	51·7	38·4	39·8	13·3	45·0	42·4	·273	3·1	0·3	91	549	56·9	35·4	0·2	9	4	4	13	2·3	7·2
Wilton House	29·776	71·0	17·0	54·0	52·6	35·5	41·2	17·1	43·8	40·4	·253	2·9	0·4	89	549	76·2	32·7	1·3	7	8	5	11	—	6·9
Barnstaple	29·716	72·0	23·0	49·0	52·3	42·4	31·5	9·9	47·1	44·3	·283	3·4	0·4	89	547	—	—	1·2	3	7	11	10	—	6·1
Aldershot Camp	29·735	74·6	15·4	59·2	51·9	37·5	30·7	15·4	43·9	40·7	·255	2·8	0·4	89	545	72·0	35·0	1·4	5	4	11	10	1·7	7·6
Strathfield Turgiss	29·771	71·8	17·4	54·4	50·4	37·4	30·0	13·0	44·0	40·5	·251	2·9	0·4	88	544	77·5	34·1	0·5	6	8	5	12	3·8	7·1
Weybridge Heath	29·804	74·0	16·5	57·5	51·2	38·2	40·3	12·0	43·6	39·9	·248	2·8	0·4	88	550	65·4	35·8	0·5	5	7	13	6	0·7	6·9
Marlborough College	29·780	69·7	15·8	53·9	49·9	35·9	42·2	14·0	42·7	40·0	·249	2·8	0·5	90	545	73·1	34·6	—	6	8	8	9	—	7·9
Royal Observatory	29·754	75·1	21·1	54·0	50·9	38·2	38·5	12·7	44·2	40·7	·255	2·9	0·5	88	549	71·1	32·6	0·4	4	6	9	12	—	7·2
Camden Town	29·760	73·1	22·9	50·5	51·0	38·3	37·1	12·7	41·6	40·5	·253	2·9	0·5	85	519	69·3	35·0	—	8	4	3	15	—	6·8
Oxford	29·765	71·7	20·1	51·6	50·0	38·5	39·2	11·5	44·2	40·0	·248	2·8	0·5	85	548	75·9	36·0	0·8	5	6	10	10	1·1	7·8
Gloucester	—	70·0	11·1	58·9	50·2	37·7	42·0	12·5	—	—	—	—	—	—	—	64·4	—	0·7	7	5	9	10	0·5	6·2
Royston	29·771	72·9	20·6	52·3	51·6	37·1	35·9	13·5	43·6	40·0	·248	2·9	0·4	87	547	—	—	—	—	—	—	—	—	6·4
Cardington	29·758	72·0	20·0	52·0	50·4	36·6	30·0	13·8	43·3	40·4	·251	2·9	0·4	90	551	56·5	29·5	0·7	4	5	7	14	—	6·4
Somerleyton Rectory	29·725	72·0	20·6	51·4	51·5	38·0	35·8	13·5	41·6	42·1	·270	3·1	0·8	91	550	—	29·2	0·8	6	4	10	11	6·3	5·5
Norwich	29·717	69·5	22·0	47·5	[illegible]	37·3	31·2	12·0	43·5	41·6	·264	3·0	0·3	93	551	—	—	—	5	4	10	11	—	—
Wisbech	—	71·1	23·5	47·6	50·2	38·2	34·1	12·0	43·5	—	—	—	—	—	—	72·7	33·1	0·4	5	2	12	12	2·2	6·3
Llandudno	29·620	67·4	30·0	37·4	51·4	41·5	28·8	9·8	46·6	41·3	·261	3·0	0·6	82	546	—	—	0·8	2	5	6	17	—	6·6
Derby	29·714	67·0	21·0	46·0	49·4	38·3	37·3	11·1	43·3	40·3	·251	2·9	0·5	88	548	—	—	—	5	4	8	14	—	—
Holkham	29·726	71·2	21·8	49·4	51·7	36·5	38·9	14·2	41·1	39·5	·243	2·8	0·5	91	550	70·0	31·6	1·3	4	4	14	9	—	6·5
Hawarden	29·692	67·0	25·0	42·0	49·1	40·7	31·0	8·4	44·5	41·9	·267	3·1	0·3	90	545	62·2	25·4	1·5	4	2	12	12	0·7	6·6
Liverpool	29·738	68·0	24·5	43·5	49·7	40·9	29·7	8·8	44·8	40·1	·248	2·9	0·5	84	547	—	—	1·2	3	7	10	10	—	6·6
Eccles	29·710	68·4	21·7	46·7	50·2	38·2	34·7	12·0	44·1	39·9	·247	2·8	0·5	86	548	54·7	31·3	0·4	5	4	9	12	2·2	6·7
Moorside, Halifax	29·667	67·1	25·0	42·1	48·1	38·3	31·4	10·1	43·1	40·0	·248	2·8	0·4	89	542	58·4	33·9	—	5	6	5	14	2·5	7·7
Bermerside, Halifax	29·704	68·8	23·2	45·6	47·4	37·7	31·5	9·7	42·7	39·1	·241	2·8	0·4	88	542	67·2	31·9	0·8	4	4	7	15	—	7·6
Hull	29·707	67·0	25·0	42·0	48·8	37·4	31·7	11·4	43·1	38·6	·234	2·8	0·5	85	551	60·5	34·3	—	—	—	—	—	2·0	—
Stonyhurst	29·720	68·0	24·9	43·1	49·2	38·1	31·3	11·1	43·3	39·8	·244	2·8	0·5	87	544	76·3	33·5	—	6	4	9	12	—	7·4
Bradford	29·629	68·4	28·0	40·4	50·1	39·3	29·9	10·8	41·5	40·5	·253	2·9	0·5	84	542	56·4	—	0·8	—	—	—	—	—	7·5
Leeds	29·682	70·0	25·0	45·0	49·7	38·2	33·0	10·8	44·7	40·4	·252	2·9	0·5	85	547	54·8	—	1·2	7	4	4	13	—	7·9
Cockermouth	29·634	64·2	23·0	41·2	49·7	40·3	34·1	9·4	41·5	40·[illegible]	·25[illegible]	3·0	0·4	87	544	63·4	30·9	0·5	1	8	13	9	2·8	6·4
Allenheads	29·610	61·3	21·0	40·3	48·2	34·8	31·[illegible]	11·1	40·0	37·1	·221	2·6	0·4	90	526	67·6	31·9	1·5	—	—	—	—	—	6·5
Silloth	29·615	63·0	23·4	39·6	50·5	39·6	33·2	10·9	44·8	38·8	·234	2·8	0·7	79	548	69·3	34·7	1·5	4	7	6	14	2·8	6·4
Carlisle	29·654	63·1	21·3	41·8	49·3	37·6	35·0	12·7	42·7	39·7	·244	3·0	0·3	86	549	57·2	32·2	1·7	2	5	9	14	5·7	6·5
Bywell	29·629	64·0	27·0	37·0	51·6	39·5	29·7	11·1	44·6	37·5	·225	2·6	0·8	77	547	59·0	31·9	1·3	4	5	6	16	—	5·1
Miltown (Ireland)	29·654	65·0	25·0	40·0	49·5	38·0	32·7	11·5	43·5	39·5	·243	2·8	0·5	86	547	66·7	32·8	2·1	5	4	15	7	—	4·9

The highest temperatures of the air were at Taunton, 76°·5; Royal Observatory, 75°·1; Aldershot Camp, 74°·6; Weybridg 74°·0; Camden Town, 73°·1; and at Royston, 72°·9.

The lowest temperatures of the air were at Gloucester, 11°·1; Aldershot Camp, 15°·4; Marlborough College, 15°·8; Weybrid 16°·5; Wilton House, 17°·0; and at Strathfield Turgiss, 17°·4.

The greatest daily ranges of the temperatures of the air were at Holkham, 14°·2; Marlborough College, 14°·0; Cardingto Royston and Somerleyton, 13°·5; Aldershot Camp, 13°·4; Taunton, 13°·3; Strathfield Turgiss, 13°·0; and at Royal Observatory Town, and Carlisle, 12°·7 respectively.

The least daily ranges of the temperatures of the air were at Guernsey, 8°·0; Hawarden, 8°·4; Liverpool, 8°·8; Helston, 9°·0; mouth and Cockermouth, 9°·4 respectively; Brighton, 9°·6; Bermerside, Halifax, 9°·7; and at Llandudno, 9°·8.

The greatest numbers of rainy days were at Stonyhurst, 79; Helston, 64; Allenheads, 61; Miltown, 56; Eccles, 55; He Cockermouth, 53; Bywell, 52; and at Hawarden and Liverpool, 50 respectively.

The least numbers of rainy days were at Cardington, 29; Norwich, 30; Holkham and Gloucester, 33 respectively; Sidmouth an field Turgiss, 31 respectively; Wilton House, Royal Observatory, and Bradford, 35 respectively; and at Weybridge Heath and W respectively.

The heaviest falls of rain were at Stonyhurst, 11·94 inches; Cockermouth, 12·09 inches; Allenheads, 10·40 inches; Silloth, 9· Guernsey, 9·43 inches; and at Helston, 8·16 inches.

The least falls of rain were at Norwich, 3·44 inches; Holkham, 3·73 inches; Gloucester, 4·01 inches; Somerleyton, 4·0 Hull, 4·32 inches; Wisbech, 4·33 inches; Leeds, 4·14 inches; and at Cardington, 4·60 inches.

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	WIND. Mean Estimated Strength.	WIND. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.
	in.	°	°	°	°	°		°	°	°	in.	grs.	gr.		grs.									
Guernsey	29·726	68·5	32·0	36·5	53·2	45·2	22·5	8·0	49·0	44·7	·302	3·4	0·5	86	543			1·3	6	7	9	9	4·0	6·2
Between the latitudes 50° and 51°	29·735	69·6	26·3	43·3	52·6	42·1	[illegible]	10·2	[illegible]	43·2	·281	3·3	0·5	[illegible]	547	[illegible]	[illegible]	1·2	8	5	7	11	—	[illegible]
51° and 52°	29·761	[illegible]	19·1	[illegible]	[illegible]	[illegible]	[illegible]	13·0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	548	[illegible]	[illegible]	0·8	6	6	8	11	[illegible]	[illegible]
52° and 53°	29·729	70·3	21·2	49·1	50·1	37·9	39·2	[illegible]	44·1	40·7	[illegible]	3·0	0·4	[illegible]	549	65·0	30·9	0·8	5	4	9	13	[illegible]	[illegible]
53° and 54°	29·708	68·1	24·7	43·4	[illegible]	[illegible]	[illegible]	10·4	[illegible]	[illegible]	[illegible]	2·9	[illegible]	[illegible]	545	[illegible]	[illegible]	1·0	5	4	8	13	[illegible]	[illegible]
54° and 55°	29·655	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11·1	[illegible]	[illegible]	·233	2·8	0·5	84	544	[illegible]	[illegible]	1·3	3	6	9	13	[illegible]	[illegible]
Miltown, Banbridge (Ireland)	29·651	65·0	25·0	[illegible]	[illegible]	[illegible]	32·7	11·5	[illegible]	[illegible]	·243	2·8	0·5	[illegible]	547	66·7	32·8	2·1	5	4	17	7	—	[illegible]
Mean for the Quarter, 50° to 55°, Year 1870	29·571	67·8	11·1	56·7	47·7	35·1	39·4	12·3	41·2	37·4	·227	2·7	0·5	87	547	62·6	24·6	0·9	7	7	6	11	—	[illegible]
" 1871	29·762	65·0	19·1	45·9	48·5	39·7	30·6	11·8	[illegible]	38·4	·232	2·7	0·5	87	520	65·1	31·2	0·9	6	6	8	10	3·1	[illegible]
" 1872	29·638	67·5	25·6	[illegible]	50·3	39·6	30·6	10·7	41·7	41·1	·250	3·0	0·4	88	544	64·7	34·1	1·2	5	5	10	10	3·6	[illegible]
" 1873	29·711	65·8	22·8	[illegible]	50·5	39·1	31·0	11·4	44·6	40·8	·256	2·9	0·5	[illegible]	546	65·1	[illegible]	1·0	5	5	8	12	3·2	[illegible]

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING MARCH 31, 1874.

Remarks on the Weather during the Quarter ending March 31st, 1874.

By James Glaisher, Esq., F.R.S., *&c.*

The warm period which set in on 15th December 1873, continued with very few and slight exceptions throughout the whole of January and until the 3d day of February, the average daily excess of mean temperature for these 51 days was 4°·6, and for the 34 days from 1st January was 4°·7; during this lengthened warm period, the direction of the wind was usually a compound of the S. and W. On the 4th of February the wind was N.E., and a cold period began, which continued till the 12th day, the direction of the wind being usually a compound of the E. with N. or S., the average daily deficiency was 6¼°.

On the 12th day of February the direction of the wind changed to S.W., and the temperature of the air passed above the average, and continued above for 19 days, its average daily excess was 3°·1; this was followed by 10 days of cold weather, from March 4th to March 13th, and during this period snow fell generally over the country, the average daily deficiency of temperature being 4½°; from March 13th to the end of the quarter the weather was warm, and the average excess of mean daily temperature was 5½° nearly.

The mean temperature for the month of January at Greenwich was 1°·1 higher than that of December, that of February was 3° below that of January, and that of March was 5° above that of February. From the preceding 33 years observations the mean temperature of January is lower than that of December by 2°, that of February is higher than that of January by 1°, and that of March is higher than that of February by 2½°. The excess of temperature of January (1873) over that of December was not general over the whole country but extended from extreme southern stations to latitude 52°, the mean increase between these parallels being 1°·1. North of the parallel of 52°, January was of lower temperature than the preceding December, to the mean amount of 1°·0; there was a decrease of temperature from January to February, everywhere, its average over the whole country being 2°·6; and there was a general increase from February to March, its mean value being 4°·2.

The reading of the barometer at 159 feet above the level of the sea was variable till the 20th of January. On the 1st it was 30 inches, decreased to the lowest point in the month on the 3d, viz., 29·12 ins.; increased to 30·2 ins. on the 6th, was generally about 29·7 ins. and 29·8 ins. from the 8th to the 15th, decreased to 29·17 on the 16th, passed above 30 ins. on the 21st, and continued at or above 30 ins. till the end of the month. The highest reading in the month was 30·39 ins. on the 25th. In February, the reading of the barometer continued high till the 13th day, and after this was alternately above and below its average till the end of the month. The highest reading was 30·46 ins. on the 4th, and the lowest was 28·95 ins. on the 26th.

In March the barometer reading was somewhat below its average on the 8th, 9th, 10th, and 11th; again on the 19th, 29th, and 31st, on all other days it was above. The highest reading in the month was 30·56 ins. on the 6th, and the lowest was 29·37 ins. on the 9th.

At Greenwich the decrease of atmospheric pressure from December 1873 to January 1874 was 0·216 in.; from January to February it was 0·039 in., and the increase from February to March was 0·161 in. The mean decrease from all stations from December to January was 0·223 in., from January to February it was 0·022 in., and from February to March there was an increase of 0·175 in.

The mean temperature of January was 41°·7 being 5°·4 higher than the average of 103 years, and 3°·4 higher than the average of the preceding 33 years. It was 0°·4 lower than in 1873 and 0·4 higher than in 1871, so that the mean temperature for the last 3 consecutive Januaries is 41°·7. Back to 1771 there is only one instance in which the mean temperature of 3 consecutive Januaries has been so high, viz., in the years 1851, 1852, and 1853 when the values were 42°·9, 42°·0, and 42°·4, the mean of which is 42°·4. Since the year 1771 there have been 9 Januaries of somewhat higher temperature than in last January, viz.:—

In the year 1796	it was 45°·3.	In the year 1846	it was 43°·7.	In the year 1853	it was 42°·4.
„ 1804	„ 43°·2.	„ 1851	„ 42°·9.	„ 1863	„ 41°·8.
„ 1834	„ 44°·4.	„ 1852	„ 42°·0.	„ 1866	„ 42°·6.

The mean temperature of February was 38°·7, being 0°·6 lower than the average of the preceding 33 Februaries, 4°·4 warmer than in 1873, and 6°·1 colder than in 1872.

The mean temperature of March was 43°·7 being 2¾° higher than the average of 103 years, and 2°·1 higher than that of the preceding 33 years, higher than in 1873 by 1°·8, but lower than in 1872 by 0°·9. The month of March was warm, but back to 1771 the mean temperature has been exceeded 21 times.

The mean temperature of the quarter was 41°·4, the average temperature for the first 3 months of the year as found from the previous 103 years was 38°·7, and as found from the preceding 33 years 39°·8; the excess of temperature for the quarter over the former is 2°·7, and over the latter is 1°·6.

The mean high day temperatures were respectively 4°·1 and 2°·9 higher than their averages in January and March, but 0°·5 lower in February.

The mean low night temperatures were higher than their respective averages in January and March by 2°·6 and 1°·4, but lower in February by 0°·7.

Thus the days and nights were warm in January and March, but somewhat cold in February.

The daily ranges of temperature were greater than their respective averages in January, *February, and March* by 1°·5, 0°·2, and 1°·5 respectively.

E. & S.—550.—5/74. A

The fall of rain in January was one inch, being only about one half of the average, in February it was 0·94 in., being about two thirds of the average, and in March it was 0·45 in. only, being less than one third of the average. Since the year 1815 there have been 12 Januaries with falls of one inch, or less than one inch, viz., the fall

In the year 1815 was 0·9.	In the year 1829 was 0·4.	In the year 1858 was 0·8.
„ 1822 „ 0·6.	„ 1835 „ 0·7.	„ 1859 „ 0·8.
„ 1824 „ 1·0.	„ 1838 „ 0·9.	„ 1861 „ 0·6.
„ 1826 „ 0·3.	„ 1842 „ 1·0.	„ 1864 „ 0·9.

Since the year 1815 there have been 16 Februaries with falls of one inch or less than one inch, viz., the fall

In the year 1820 was 0·6.	In the year 1832 was 0·9.	In the year 1863 was 0·5.
„ 1821 „ 0·4.	„ 1855 „ 1·0.	„ 1864 „ 0·8.
„ 1825 „ 1·0.	„ 1856 „ 0·9.	„ 1870 „ 0·5.
„ 1827 „ 0·7.	„ 1857 „ 0·2.	„ 1872 „ 0·8.
„ 1834 „ 0·4.	„ 1859 „ 0·9.	
„ 1845 „ 0·9.	„ 1862 „ 0·5.	

Since the year 1815 there have been 19 instances in March with falls of one inch or less than one inch, viz., the fall

In the year 1828 was 1·0.	In the year 1840 was 0·3.	In the year 1854 was 0·3.
„ 1829 „ 0·7.	„ 1843 „ 0·5.	„ 1857 „ 1·0.
„ 1830 „ 0·3.	„ 1846 „ 0·9.	„ 1858 „ 0·8.
„ 1833 „ 1·0.	„ 1847 „ 0·8.	„ 1863 „ 0·7.
„ 1834 „ 0·7.	„ 1849 „ 0·6.	„ 1865 „ 0·8.
„ 1837 „ 0·5.	„ 1850 „ 0·4.	
„ 1838 „ 1·0.	„ 1852 „ 0·2.	

So that five times only, viz., in the years 1830, 1840, 1850, 1852, and 1854, has the fall of rain in March been smaller than in March 1874.

The fall of rain in the three months ending 31st March 1874 was 2·39 ins., the average fall for these three months is 5·0 ins., so that the fall is less than one half of its usual amount; back to 1815 the instances of falls in these three months not exceeding 3 ins. are as follows :—

In the year 1820 it was 3·0.	In the year 1829 it was 2·4.
„ 1854 „ 2·9.	„ 1874 „ 2·4.

So that the only instance of so small a fall in these months was in the year 1829.

The fall of rain in December was 0·3 in. only, and in the four consecutive months ending March the total fall was 2·69 ins.

The average fall for the four months was 7·0 ins., so that for one third part of a year, viz., December to March, the fall of rain has been but little more than one third part of its average fall.

Instances of small falls of rain in these four consecutive months back to 1815 are :—

In 1829 the amount was 4·9.	In 1830 the amount was 4·6.
1847 „ 4·7.	1854 „ 3·7.
1858 „ 3·7.	1859 „ 4·8.
1864 „ 4·3.	1874 „ 2·7.

So that, back to 1815, there is no instance of so small a rainfall as 2¾ ins. in these four months.

The average duration of the different directions of the wind referred to eight points of the compass, and the duration of each direction in each month in the quarter, were as follows :—

Direction of Wind.	January.			February.			March.		
	Average.	1874.	Departure from Average.	Average.	1874.	Departure from Average.	Average.	1874.	Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	1½	2	+ ½	2	2	0	2¾	3	+ ¼
N.	3	3	0	3	4	+ 1	3¾	4	+ ¼
N.E.	3¼	0	−3¼	3½	2	−1½	4	2	−2
E.	¼	0	− ¼	2¼	2	− ¼	2½	1	−1½
S.E.	2½	1	−1½	1¼	3	+1¾	2¼	2	− ¼
S.	4¼	3	−1¼	3	4	+1	2½	1	−1½
S.W.	9¾	11	+1¼	8	7	−1	7¾	8	+ ¼
W.	3½	11	+7½	3	3	0	3¼	9	+5¾
Calm, nearly.	2½	0	−2½	2	1	−1	2¼	1	−1¼

The + signs, denoting excesses over averages, are confined in January entirely to a compound of the W.; in February to N., S.E. and S., and in March to N.W. and N., and to S.W. and W. The prevalence of − signs opposite to E. and compounds of the E., in both January and March are remarkable. The excess in the duration of the West wind in these months is also marked.

Thunderstorms occurred, on the 3rd of January at Guernsey and Helston; and on the 4th at Eccles. On the 8th of March at Helston; on the 9th at Llandudno; and on the 31st at Stonyhurst.

Thunder was heard, but lightning was not seen, on the 4th of January at Halifax.

Lightning was seen, but thunder was not heard, on the 3rd of January at Taunton and Norwich on the 12th at Norwich; on the 16th at Halifax; and on the 18th at Silloth. On the 18th of February at Osborne and Taunton. On the 9th of March at Eccles, Halifax, and Hull; and on the 10th at Strathfield Turgiss and Halifax.

874. ...THS.	Temperature of Air. Mean.	Air. Diff. from average of 103 years.	Air. Diff. from average of 33 years.	Evaporation. Mean.	Evaporation. Diff. from average of 33 years.	Dew Point. Mean.	Dew Point. Diff. from average of 33 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 33 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 33 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour in a Cubic Foot of Air. Diff. from average of 33 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
...n. -	41·7	+5·4	+3·4	40·0	+3·1	37·9	+2·9	11·1	+1·5	41·0	0·228	+0·025	2·6	+0·2
...b. -	38·7	+0·1	−0·6	36·8	−0·8	34·2	−0·9	11·5	+0·2	40·3	0·197	−0·009	2·3	+0·1
...r. -	43·7	+2·7	+2·1	41·2	+1·9	38·2	+1·8	16·2	+1·5	43·8	0·231	+0·015	2·7	+0·2
...ans -	41·4	+2·7	+1·6	39·3	+1·4	36·8	+1·3	12·9	+1·1	41·7	0·219	+0·010	2·5	+0·2

...74. ...THS.	Degree of Humidity. Mean.	Degree of Humidity. Diff. from average of 33 years.	Reading of Barometer. Mean.	Reading of Barometer. Diff. from average of 33 years.	Weight of a Cubic Foot of Air. Mean.	Weight of a Cubic Foot of Air. Diff. from average of 33 years.	Rain. Amount.	Rain. Diff. from average of 59 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
... -	87	− 1	29·891	+0·156	552	−1	1·0	−0·9	334	16	12	3	19·0	42·0
... -	85	0	29·852	+0·056	555	+2	0·9	−0·6	261	18	8	2	14·3	44·7
...r. -	81	− 1	30·013	+0·271	552	+2	0·5	−1·1	339	14	12	5	15·0	46·8
...ns -	84	− 1	29·919	+0·161	553	+1	Sum 2·4	Sum −2·6	Mean 311	Sum 48	Sum 32	Sum 10	Lowest 14·3	Highest 46·8

...TE.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the sign (+) signifies above the average.

...olar halos were seen, on the 1st of January at Oxford; and on the 6th at Weybridge Heath. ...the 11th of February at Oxford and Halifax. On the 14th of March at Weybridge Heath; on ...20th at Carlisle; on the 21st at Halifax; on the 24th at Oxford; on the 25th at Weybridge ...th, Strathfield Turgiss, and Halifax; on the 26th at Stonyhurst; and on the 27th at Helston.

...unar halos were seen, on the 2nd of January at Portsmouth, Weybridge Heath, Salisbury, ...ord, Royston, Halifax, and Leicester; on the 3rd at Oxford and North Shields; on the 4th and ...at North Shields; on the 23rd at Silloth; on the 24th at Oxford; on the 25th at Wisbech; on ...26th at Portsmouth; on the 27th at Halifax; on the 28th at North Shields; and on the 30th ...alifax. On the 1st of February at Bywell; on the 4th at London; on the 24th at Taunton; ...on the 28th at London, Oxford, and Halifax. On the 23rd of March at London; on the 24th ...Visbech, Stonyhurst, and North Shields; on the 26th at Halifax, Eccles, Stonyhurst, Cocker-...th, and Silloth; on the 27th at Oxford and Halifax; on the 28th at Wisbech and Leicester; ...he 30th at Leicester and Halifax; and on the 31st at Halifax.

...urora boreales were seen, on the 6th of January at Cockermouth; on the 16th at Weybridge ...th and Silloth; on the 17th at Stonyhurst and Carlisle; on the 18th at Carlisle; and on the ... at Helston. On the 4th of February at Portsmouth, Taunton, Weybridge Heath, Salisbury, ...atley, Leicester, Oxford, Wisbech, Eccles, Stonyhurst, Cockermouth, Allenheads, Silloth, and ...ell; on the 5th at Silloth; on the 16th at Weybridge Heath; and on the 17th at Silloth. On ...7th of March at Silloth, Bywell, and North Shields.

...ow fell, on the 2nd, 3rd, 4th, 5th, 16th, 17th, 24th, and 25th of January, and on the 8th, ..., 15th, 17th, 18th, and 26th of February at several stations. On the 7th and 8th of March at ...ton; and on the 9th, 10th, 11th, and 12th all over the country.

...ail fell, on 7 days in January, 5 days in February, and 10 days in March.

...g was more than usually prevalent during the quarter.

...af buds first appeared—

...he Field Elm,	the earliest	February 8, at Eastbourne;	the latest	March 23, at Carlisle.
Lime,	„	March 18, at Weybridge;	„	March 30, at Guernsey.
Sycamore,	„	January 19, at Eastbourne;	„	March 15, at Carlisle.
Horsechestnut,	„	January 12, at Eastbourne;	„	March 25, at Carlisle.
Hawthorne,	„	February 8, at Eastbourne;	„	March 14, at Guernsey.
...af Horsechestnut,	„	March 21, at Helston;	„	March 31, at Guernsey.
Hawthorne,	„	March 3, at Helston;	„	March 28, at Guernsey.
...lossom Peach,	„	February 14, at Llandudno;	„	March 20, at Wisbech.
„ Plum,	„	March 2, at London;	„	March 26, at Silloth.
„ Cherry,	„	March 25, at Miltown;	„	March 31, at Oxford.

...vallow arrived, on the 8th of March at Taunton.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING MARCH 31st, 1874.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S., F.M.S.	204	Jan.	29·908	1·190	54·0	34·5	19·5	50·3	41·7	8·6	46·1	43·0	·277	3·2	0·4	89	548	—	—	1·6	5	4	11	11	4·4	6·7	20	1·94
		Feb.	29·796	1·464	52·5	27·0	25·5	48·7	39·7	9·0	43·9	39·6	·244	2·8	0·5	85	548	—	—	1·3	6	8	8	6	3·0	3·9	14	2·42
		Mar.	30·032	1·018	60·0	31·0	29·0	50·4	42·0	8·4	45·2	41·1	·258	3·0	0·5	86	551	—	—	1·4	8	4	7	12	4·3	5·1	12	0·85
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	106	Jan.	30·047	1·170	56·0	32·0	24·0	53·0	42·5	10·5	47·9	43·2	·279	3·4	0·7	84	546	57·8	38·8	1·8	8	3	7	13	4·9	6·3	20	4·57
		Feb.	29·861	1·650	56·0	35·0	21·0	53·2	41·2	12·0	47·1	40·3	·250	3·1	0·9	78	543	63·6	37·0	2·2	4	8	8	8	4·9	5·8	16	2·95
		Mar.	30·149	1·013	60·0	27·0	33·0	54·3	42·9	11·4	47·9	41·4	·261	3·2	0·9	77	553	72·5	39·0	1·8	8	6	7	10	4·2	5·5	11	1·65
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	Jan.	30·054	1·230	55·0	30·0	25·0	51·0	41·0	10·0	45·7	41·2	·260	3·0	0·6	85	551	—	—	2·5	8	1	5	17	—	7·8	23	4·80
		Feb.	29·931	1·598	53·0	31·0	22·0	50·3	40·5	9·8	45·0	39·8	·245	2·8	0·6	82	549	—	—	2·8	5	6	8	9	—	7·5	18	4·35
		Mar.	30·208	0·979	58·0	28·0	30·0	52·7	42·3	10·4	46·5	40·7	·255	2·9	0·7	82	553	—	—	2·7	10	5	2	14	—	7·1	17	1·17
SIDMOUTH (Devon), J. Ingleby Mackenzie, Esq., M.B., F.M.S.	30	Jan.	30·065	1·272	53·8	29·1	24·7	49·3	38·2	11·1	44·3	38·5	·233	2·7	0·6	80	553	—	—	1·0	8	1	8	19	—	4·2	15	2·86
		Feb.	29·955	1·628	52·0	28·1	23·9	47·3	37·8	9·5	42·3	40·3	·250	2·9	0·2	93	553	—	—	1·5	7	7	8	6	—	3·7	16	3·36
		Mar.	20·222	1·110	58·6	25·0	33·6	50·9	39·5	11·4	44·9	41·7	·264	3·0	0·4	90	555	—	—	1·5	7	4	7	13	—	3·5	7	0·47
EASTBOURNE (Sussex), Miss W. L. Hall.	12	Jan.	30·079	1·114	53·0	30·1	22·9	48·9	38·7	10·2	44·2	40·3	·250	2·9	0·4	86	553	57·9	31·6	0·5	5	1	8	17	4·5	—	15	2·99
		Feb.	30·033	1·314	54·6	24·5	30·1	47·0	35·2	11·8	41·2	37·8	·227	2·6	0·4	88	557	71·2	29·3	0·6	7	5	8	8	2·8	—	10	1·16
		Mar.	30·212	0·989	65·5	23·7	41·8	52·7	37·9	14·8	45·4	40·7	·253	2·9	0·5	84	554	92·3	31·4	0·5	10	2	4	15	2·5	—	10	0·79
OSBORNE (Isle of Wight), J. R. Mann, Esq.	172	Jan.	29·898	1·264	52·7	28·3	24·4	48·7	37·6	11·1	43·3	41·1	·258	3·0	0·3	92	550	58·3	27·1	0·3	4	2	10	15	—	7·6	16	1·82
		Feb.	29·830	1·462	55·3	25·4	29·9	47·3	34·9	12·4	41·0	38·5	·233	2·7	0·3	91	552	67·3	24·7	0·2	5	6	7	10	—	6·2	14	2·18
		Mar.	30·048	1·108	62·3	23·7	38·6	52·3	37·2	15·1	44·2	41·2	·260	2·9	0·4	89	552	79·1	33·0	0·2	5	4	8	14	—	6·5	15	0·46
BOURNEMOUTH (Hants), T. A. Compton, Esq., M.D., B.A., F.M.S.	128	Jan.	30·050	1·330	53·2	31·3	21·9	48·4	38·7	9·7	43·8	38·1	·230	2·8	0·4	80	553	—	—	—	7	1	7	16	—	4·5	15	2·17
		Feb.	30·015	1·420	51·0	25·3	25·7	45·9	36·2	9·7	40·8	38·5	·235	2·8	0·4	92	556	—	—	—	10	6	6	6	—	4·8	13	2·25
		Mar.	30·230	1·070	58·0	25·9	32·1	50·7	39·3	11·4	44·4	40·1	·250	2·9	0·4	84	556	—	—	—	10	4	3	14	—	4·6	7	0·50
PORTSMOUTH, William C. Ellis, Esq.	16	Jan.	30·082	1·310	56·2	25·0	31·2	51·9	37·3	14·6	44·7	38·8	·236	2·7	0·6	80	553	54·4	33·6	1·6	4	3	10	14	1·9	6·5	15	1·52
		Feb.	30·028	1·500	55·8	22·4	33·4	48·9	34·3	14·6	40·7	38·5	·234	2·7	0·4	92	556	66·2	32·0	2·5	4	5	8	11	1·5	5·5	13	1·70
		Mar.	30·216	1·126	—	—	—	—	—	—	—	—	—	—	—	—	—	80·0	34·0	2·0	5	5	8	13	2·5	6·5	8	0·36
WORTHING (Sussex), W. J. Harris, Esq., M.R.C.S.E., L.S.A., F.M.S.	31	Oct.	29·834	1·591	69·0	32·1	36·9	58·4	44·5	13·9	50·1	48·0	·335	3·8	0·3	93	541	92·5	40·2	0·8	6	8	6	11	2·9	6·0	19	3·94
		Nov.	29·842	1·245	59·5	34·8	24·7	51·3	41·8	9·5	46·3	41·6	·251	3·0	0·6	88	546	69·8	37·7	1·0	8	8	4	10	3·8	6·8	14	1·75
		Dec.	30·241	1·036	54·3	26·9	27·4	47·6	38·4	9·2	43·2	39·6	·242	2·8	0·4	87	557	60·9	34·1	0·6	9	4	6	12	4·4	6·3	7	0·66
		Jan.	20·070	1·251	52·7	29·2	23·5	47·9	38·1	9·8	43·2	39·9	·247	2·8	0·4	88	554	65·4	32·5	0·9	6	3	6	16	2·8	6·0	17	2·04
		Feb.	29·968	1·529	55·0	26·6	28·4	46·6	36·8	9·8	41·4	37·8	·238	2·6	0·4	88	554	72·1	—	1·0	6	6	8	8	3·9	5·4	9	1·07
		Mar.	30·181	1·185	58·5	23·4	35·1	51·4	38·8	12·6	44·5	40·0	·247	2·9	0·4	84	555	91·4	32·9	0·9	9	3	3	16	2·3	6·0	7	0·64
BRIGHTON (Sussex), Frederick E. Sawyer, Esq., F.M.S.	200	Jan.	29·880	1·223	51·0	29·7	20·3	46·0	38·1	7·9	42·2	39·6	·243	2·8	0·3	90	551	71·4	31·5	0·9	8	0	7	16	—	6·7	16	2·25
		Feb.	29·824	1·551	50·4	25·0	25·4	44·2	35·8	8·4	39·8	36·8	·219	2·6	0·3	90	553	72·8	30·5	0·9	9	5	8	6	—	6·2	10	1·56
		Mar.	30·011	1·159	58·0	22·8	35·2	48·9	38·5	10·4	43·3	38·7	·235	2·7	0·5	83	558	86·9	32·8	0·9	8	2	5	16	—	7·9	11	0·60
TAUNTON (Somerset), James Bottomley, Esq.	80	Jan.	29·966	1·281	54·0	25·0	29·0	49·3	38·3	11·0	44·0	40·9	·257	2·9	0·4	89	551	53·8	33·4	0·3	7	1	7	16	6·1	6·6	16	3·16
		Feb.	29·902	1·598	54·2	15·5	38·7	47·9	33·4	14·5	40·9	38·8	·236	2·7	0·3	93	553	53·4	30·5	0·4	7	7	6	8	3·0	7·4	15	2·72
		Mar.	30·158	1·098	61·0	26·0	35·0	52·7	38·7	14·0	45·3	40·0	·248	2·8	0·6	82	553	62·1	35·5	0·4	12	3	4	12	7·2	2·8	10	0·39
WILTON HOUSE (near Salisbury), T. Challis, Esq.	186	Jan.	29·882	1·222	56·0	21·0	35·0	49·5	32·0	17·5	41·2	38·5	·233	2·7	0·3	91	553	68·4	28·7	1·0	2	5	8	16	4·0	7·0	16	2·84
		Feb.	29·798	1·588	54·0	20·0	34·0	48·4	30·7	17·7	39·5	36·5	·216	2·5	0·3	89	553	79·4	27·9	1·4	5	10	8	5	—	6·8	12	2·96
		Mar.	30·019	1·122	68·0	20·5	47·5	55·2	34·9	20·3	44·0	41·8	·263	3·0	0·3	92	552	94·6	33·0	1·6	8	4	7	12	3·2	6·9	12	0·58
BARNSTAPLE (Devon), T. Mackrell, Esq.	45	Jan.	30·028	1·340	55·0	30·0	25·0	49·7	39·6	10·1	44·8	42·7	·273	3·2	0·2	93	551	—	—	1·2	5	2	10	14	—	6·1	24	4·06
		Feb.	29·929	1·760	54·5	30·5	24·0	46·7	38·8	9·9	44·4	40·7	·255	2·9	0·4	88	551	—	—	1·3	4	6	12	6	—	5·3	17	2·81
		Mar.	30·173	1·100	60·0	27·0	33·0	59·7	42·4	10·3	46·9	40·8	·255	3·0	0·7	90	552	—	—	1·3	5	3	8	15	—	5·1	14	2·07

Meteorological Table, Quarter ending March 31st, 1874.

Names of Stations and Observers.	Height of Sta. above Sea Level.	Months.	Month. Mean.	Month. Range.	Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Daily Range.	Air.	Dew Point.	Elastic Force.	In a Cubic foot of Air. Mean.	In a Cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Sat.=100	Mean Weight of cubic foot of Air.	Thermometer. Maximum in Rays of Sun.	Thermometer. Minimum on Grass.	Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount Ozone.	Mean Amount Cloud.	Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
ALDERSHOT CAMP (Hants), John Arnold, Esq., M.S.C., F.M.S.	325	Jan.	29.701	1.112	53.8	29.2	24.6	47.9	35.3	12.6	40.2	38.3	.232	2.7	0.3	93	551	69.4	31.9	1.6	4	0	14	13	1.8	7.6	20	1.82
		Feb.	29.652	1.410	52.4	22.0	30.4	45.0	32.7	12.3	38.4	36.3	.214	2.4	0.3	93	552	69.3	28.2	1.5	5	4	9	10	1.6	7.9	16	2.27
		Mar.	29.822	1.122	67.2	22.0	45.2	53.9	35.4	18.5	43.4	38.4	.232	2.7	0.4	82	548	88.1	30.2	1.8	7	3	6	15	1.9	7.3	9	0.48
ST. AUGUSTINE'S MONASTERY, (Ramsgate), Rev. E. J. Stutter, O.S.B.	108	Jan.	29.973	1.028	52.5	30.5	22.5	47.5	37.2	10.3	43.3	41.1	.259	3.0	0.3	92	552	71.3	33.8	1.8	6	3	5	17	—	6.3	—	—
		Feb.	29.934	1.305	54.3	24.0	30.3	45.6	35.2	10.4	40.7	38.2	.231	2.7	0.2	91	556	80.5	32.7	1.4	6	4	11	7	—	7.6	—	—
		Mar.	30.056	1.226	61.0	25.3	35.7	51.6	38.2	13.4	44.6	40.4	.253	2.9	0.5	86	552	99.4	34.5	1.5	8	5	5	13	—	7.0	—	—
STRATHFIELD TURGISS (Hants), Rev. C. H. Griffith, M.A., F.M.S.	197	Jan.	29.873	1.266	53.0	30.0	23.0	47.3	35.5	11.8	41.6	38.2	.231	2.7	0.3	89	551	70.8	31.3	0.6	4	2	9	16	4.5	6.4	15	2.11
		Feb.	29.812	1.398	52.9	22.6	30.3	45.3	32.6	12.7	38.8	36.2	.215	2.5	0.3	92	551	71.6	28.1	0.6	7	7	7	7	3.5	7.1	12	1.79
		Mar.	29.996	1.136	64.7	24.3	40.4	52.3	36.5	15.8	43.8	38.4	.232	2.7	0.5	91	552	97.2	31.2	0.8	7	4	6	14	5.2	6.7	12	0.49
WEYBRIDGE HEATH (Surrey), William F. Harrison, Esq., F.M.S.	150	Jan.	29.953	1.121	54.3	27.5	26.8	46.1	36.5	9.6	41.2	38.5	.232	2.7	0.4	91	554	57.0	31.3	0.8	4	4	16	7	1.4	6.2	15	1.19
		Feb.	29.892	1.580	54.0	20.5	33.5	45.0	33.4	11.6	38.6	35.5	.210	2.4	0.4	90	556	62.7	30.9	0.7	6	8	12	2	1.4	6.7	13	1.52
		Mar.	30.073	1.166	67.5	19.5	48.0	53.4	35.8	17.6	43.8	38.8	.236	2.7	0.6	82	553	83.2	32.5	0.8	5	3	13	10	1.3	6.4	13	0.49
MARLBOROUGH COLLEGE (Wilts), Rev. Thomas A. Preston, M.A., F.M.S.	456	Jan.	29.581	1.282	52.2	25.3	26.9	46.8	34.3	12.5	40.6	38.8	.236	2.7	0.2	93	548	63.4	31.8	—	4	0	14	13	—	8.0	18	3.46
		Feb.	29.534	1.528	54.4	21.3	23.1	44.7	31.8	12.9	38.3	34.7	.202	2.3	0.3	88	550	74.6	31.1	—	7	6	6	9	—	8.2	16	2.57
		Mar.	29.720	1.154	61.6	22.6	38.4	50.7	35.7	15.0	42.1	38.3	.233	2.7	0.4	87	549	101.0	34.7	—	9	5	4	13	—	8.0	13	0.93
ROYAL OBSERVATORY (Kent), The Astronomer Royal.	159	Jan.	29.891	1.275	55.0	28.1	26.9	47.3	36.2	11.1	41.7	37.9	.228	2.6	0.4	87	552	66.7	30.7	0.6	4	0	9	18	—	6.6	12	1.00
		Feb.	29.852	1.509	55.9	21.0	34.9	45.0	31.5	11.5	38.7	34.2	.197	2.3	0.5	85	555	68.5	28.1	0.4	5	7	11	5	—	7.1	9	0.94
		Mar.	30.013	1.187	65.4	22.6	42.8	52.8	33.6	16.2	43.7	38.2	.231	2.7	0.6	81	552	87.4	30.3	0.7	7	3	6	15	—	6.5	11	0.45
STREATLEY VICARAGE (Berks), Rev. J. Slatter, M.A., F.R.A.S., F.M.S.	150	Jan.	29.933	1.306	53.7	27.8	25.9	47.9	36.2	11.7	42.4	39.2	.239	2.7	0.4	89	552	52.7	—	1.7	5	1	10	15	—	6.3	18	1.99
		Feb.	29.821	1.630	54.4	21.9	32.5	45.9	34.1	11.8	40.0	37.0	.220	2.5	0.4	90	553	51.4	—	1.5	6	4	8	10	—	6.8	11	2.07
		Mar.	30.063	1.154	68.8	18.4	50.4	54.1	36.2	17.9	45.3	40.3	.250	3.1	0.6	82	551	63.3	—	1.7	9	2	7	13	—	6.6	9	0.59
ST. JOHN'S COLLEGE, BATTERSEA, Rev. J. P. Faunthorpe, M.A., F.R.G.S.	13	Jan.	30.036	1.270	57.0	25.0	32.0	52.0	33.0	19.0	42.7	40.8	.255	2.9	0.4	92	553	60.6	25.6	1.3	2	4	12	13	—	7.6	12	1.92
		Feb.	29.970	1.438	56.0	21.0	35.0	45.8	30.6	15.2	39.0	35.8	.210	2.4	0.4	89	557	55.8	24.6	1.5	3	4	12	9	—	7.3	12	1.05
		Mar.	30.150	1.138	66.0	22.0	44.0	49.2	29.5	19.7	44.3	41.5	.261	3.0	0.4	90	554	68.3	27.5	2.0	2	3	11	15	—	6.8	8	0.53
CAMDEN TOWN (London), G. J. Symons, Esq., F.M.S.	123	Jan.	29.941	1.102	55.4	28.0	27.4	47.4	35.9	11.5	42.1	38.6	.234	2.7	0.4	87	553	52.9	33.7	—	5	0	8	18	—	6.3	17	1.18
		Feb.	29.893	1.524	54.5	22.4	32.1	44.8	33.3	11.5	39.2	36.0	.212	2.4	0.4	92	555	54.9	31.1	—	10	2	9	7	—	6.6	16	0.91
		Mar.	30.065	1.182	65.4	21.9	43.5	53.3	36.9	16.4	44.5	39.4	.242	2.8	0.6	83	553	78.5	34.9	—	8	3	3	17	—	7.0	12	0.89
CHISWICK (London), Thiselton Dyer, Esq.	25	Jan.	30.050	1.252	54.2	25.0	29.2	48.4	35.9	12.5	41.9	34.8	.203	2.4	0.7	77	555	66.8	33.5	—	4	2	18	12	—	—	16	1.14
		Feb.	29.995	1.472	55.0	21.2	33.8	45.4	33.7	11.7	39.6	36.0	.211	2.4	0.4	87	557	66.0	31.6	—	6	7	9	6	—	—	12	1.24
		Mar.	30.166	1.170	60.5	21.2	39.3	53.1	36.5	16.6	43.7	38.5	.232	2.7	0.6	80	555	86.1	33.6	—	6	2	7	16	—	—	13	0.59
TOWN MUSEUM (Leicester), W. J. Harrison, Esq.	245	Jan.	29.810	1.186	52.6	28.1	24.5	46.5	36.5	10.0	41.4	38.7	.235	2.7	0.3	91	551	65.1	30.7	1.0	3	1	13	14	—	7.0	15	1.87
		Feb.	29.833	1.488	53.0	18.5	34.5	44.6	32.1	12.5	38.5	34.0	.193	2.3	0.5	85	555	76.6	27.1	0.9	3	7	11	7	—	6.7	15	1.55
		Mar.	29.898	1.182	64.4	19.5	44.9	50.7	37.3	13.4	43.6	38.3	.222	2.6	0.4	82	551	92.3	32.2	1.0	3	2	11	15	—	7.5	16	0.94
OXFORD (Oxfordshire), Rev. R. Main, M.A., F.R.S., F.R.A.S.	210	Jan.	29.833	1.333	54.0	29.8	24.2	47.6	37.2	10.4	42.4	38.8	.235	2.7	0.5	87	550	73.1	35.1	1.1	4	2	10	15	1.6	7.6	19	2.30
		Feb.	29.785	1.571	53.3	23.0	30.3	44.7	33.9	10.8	39.3	35.8	.211	2.5	0.4	88	553	75.8	32.5	1.0	5	6	9	8	1.9	7.6	16	1.68
		Mar.	29.973	1.162	63.6	22.8	40.8	51.8	37.5	14.3	44.5	38.0	.229	2.7	0.7	78	551	94.1	35.3	1.4	6	4	5	16	3.5	7.3	13	0.61
GLOUCESTER (Gloucester), E. Toller, Esq., M.D.	100	Jan.	29.994	1.283	54.9	30.9	24.0	47.8	37.6	10.2	43.2	38.8	.236	2.7	0.5	84	555	58.0	34.0	1.0	6	1	11	13	0.6	5.9	19	2.00
		Feb.	29.944	1.657	54.0	22.0	32.0	47.1	34.0	13.1	40.2	36.5	.216	2.5	0.4	87	544	72.3	30.4	1.0	6	6	7	9	1.5	5.6	12	1.76
		Mar.	30.135	1.155	61.9	21.0	40.9	53.6	37.9	15.7	45.0	38.9	.237	2.7	0.7	79	551	87.0	34.2	0.8	9	3	6	13	1.3	5.8	13	0.66
ROYSTON (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	Jan.	29.768	1.167	54.7	26.3	28.4	47.2	34.7	12.5	40.9	37.7	.226	2.6	0.3	89	551	—	—	—	3	1	10	17	—	5.5	17	1.40
		Feb.	29.731	1.540	53.1	14.6	38.5	44.7	31.9	12.8	38.5	35.0	.203	2.4	0.4	87	553	—	—	—	6	5	11	6	—	6.1	12	1.22
		Mar.	29.900	1.143	66.7	16.2	50.5	53.0	35.0	18.0	43.3	37.6	.225	2.6	0.6	80	551	—	—	—	6	2	7	16	—	7.0	16	0.86
CARDINGTON (near Bedford), Mr. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	105	Jan.	29.944	1.360	54.6	24.0	30.6	47.0	34.0	13.0	40.7	38.7	.235	2.7	0.2	93	560	48.2	27.1	1.6	2	0	9	20	—	6.3	13	1.60
		Feb.	29.925	1.500	54.0	19.6	34.4	44.7	31.6	13.1	38.1	35.7	.209	2.4	0.3	91	557	51.9	26.1	1.8	6	4	10	8	—	6.8	12	1.25
		Mar.	30.008	1.206	66.0	19.6	46.4	52.4	35.7	16.7	43.8	39.5	.243	2.8	0.4	84	553	74.1	27.3	2.5	8	3	5	15	—	7.0	8	0.70
ST. DAVID'S COLLEGE, LAMPETER (Cardiganshire), Prof. A. W. Scott.	420	Feb.	29.529	1.704	55.0	20.5	34.5	48.4	34.5	13.9	40.9	38.9	.236	2.8	0.2	98	547	65.9	—	—	-	-	-	-	—	—	11	4.39
		Mar.	29.758	1.118	62.0	8.0	54.0	51.6	35.5	16.1	43.0	41.0	.257	2.9	0.3	93	548	87.0	—	—	8	2	9	12	—	—	15	2.80

Lampeter.—The observations for the month of January are incomplete.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	Jan.	29·969	1·088	55·4	26·7	28·7	46·4	33·6	12·8	40·2	38·2	·231	2·7	0·2	93	555	—	25·2	1·0	3	1	12	15	6·9	5·5	17	0·97
		Feb.	29·975	1·454	54·1	17·5	36·6	45·2	32·1	13·1	38·0	36·3	·214	2·5	0·2	94	558	—	23·4	1·0	3	5	12	8	7·1	6·1	11	1·06
		Mar.	30·084	1·220	65·2	20·2	45·0	52·1	35·4	16·7	43·2	40·2	·246	2·8	0·3	88	554	—	25·1	1·0	7	3	8	13	5·8	5·2	14	0·95
NORWICH (Norfolk), John Quinton, Esq., Jun.	42	Jan.	29·960	1·374	55·0	27·0	28·0	45·4	33·8	11·6	40·0	38·6	·234	2·7	0·2	95	555	—	—	—	2	2	13	14	—	—	11	0·99
		Feb.	29·974	1·498	52·0	19·0	33·0	43·3	31·2	12·1	37·0	35·8	·210	2·5	0·2	95	559	—	—	—	4	4	11	9	—	—	10	1·00
		Mar.	30·085	1·244	64·5	20·0	44·5	50·7	34·7	16·0	42·3	40·3	·250	2·9	0·2	93	555	—	—	—	4	4	6	17	—	—	9	0·64
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	Jan.	29·981	1·392	54·2	27·2	27·0	46·5	35·1	11·4	41·1	38·9	·239	2·7	0·2	93	554	63·6	30·8	0·6	1	2	15	13	—	5·7	12	1·28
		Feb.	29·992	1·492	54·8	20·5	34·3	44·9	32·7	12·2	38·2	35·5	·208	2·4	0·3	90	558	70·2	29·2	0·6	4	6	10	8	—	6·5	12	0·93
		Mar.	30·124	1·280	68·0	19·4	48·6	53·0	35·8	17·2	43·8	39·6	·244	2·8	0·5	84	554	91·4	31·3	0·9	5	4	7	15	—	6·3	13	1·11
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	Jan.	29·860	1·450	55·0	34·2	20·8	49·0	40·0	9·0	44·5	39·5	·243	2·8	0·6	83	549	—	—	0·8	3	0	4	24	—	6·1	13	2·88
		Feb.	29·825	1·770	55·0	26·2	28·8	48·4	36·0	12·4	42·3	36·7	·218	2·6	0·5	82	550	—	—	0·7	3	1	9	15	—	5·7	13	1·47
		Mar.	30·012	1·216	59·4	27·5	31·9	52·7	40·2	12·5	46·3	41·0	·258	2·9	0·6	83	549	—	—	1·0	2	2	3	24	—	6·5	17	2·12
DERBY (Derbyshire), John Davis, Esq.	174	Jan.	29·778	1·385	57·0	28·0	29·0	47·2	36·2	11·0	41·1	37·1	·220	2·6	0·5	85	551	—	—	—	3	0	5	23	—	—	14	1·95
		Feb.	29·795	1·581	54·0	21·0	33·0	44·6	32·8	11·8	38·5	34·3	·198	2·3	0·5	86	554	—	—	—	5	4	10	9	—	—	15	1·45
		Mar.	29·945	1·192	67·0	21·0	46·0	52·2	38·1	14·1	[illegible]·1	37·8	·228	2·7	0·6	78	551	—	—	—	6	2	6	17	—	—	13	1·22
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	183	Jan.	29·765	1·206	52·8	25·2	27·6	46·7	33·9	12·8	40·6	38·1	·229	2·7	0·3	91	551	57·0	28·1	0·7	1	0	11	19	3·3	7·2	22	1·42
		Feb.	29·776	1·512	52·6	19·9	32·7	44·3	31·0	13·3	37·3	35·5	·207	2·4	0·2	93	555	63·7	27·0	0·5	6	5	8	9	3·0	7·3	17	1·79
		Mar.	29·928	1·190	67·7	18·1	49·6	52·0	36·5	15·5	43·4	39·5	·242	2·8	0·4	86	551	83·2	30·9	0·6	3	3	8	17	3·2	7·4	20	1·02
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	Jan.	29·931	1·290	51·0	24·0	27·0	45·0	32·7	12·3	40·0	35·9	·211	2·4	0·5	86	555	53·7	27·7	1·6	4	1	15	11	—	6·0	9	1·05
		Feb.	29·954	1·536	52·5	17·0	35·5	43·6	29·4	14·2	37·3	33·0	·188	2·2	0·5	85	559	76·2	25·4	1·3	4	6	15	3	—	5·7	9	1·35
		Mar.	30·032	1·236	65·5	21·0	44·5	50·7	32·9	17·8	42·5	35·2	·205	2·4	0·8	76	554	99·4	28·3	1·6	5	1	12	13	—	6·2	12	1·00
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	Jan.	29·737	1·366	53·2	30·6	22·6	47·4	38·9	8·5	43·0	38·4	·232	2·6	0·6	82	548	—	—	1·6	1	3	10	17	—	7·1	16	2·26
		Feb.	29·725	1·715	51·2	23·5	27·7	43·8	35·3	8·5	39·2	35·5	·210	2·4	0·4	87	552	—	—	1·1	3	10	8	7	—	7·0	12	1·22
		Mar.	29·916	1·224	56·7	25·5	31·2	50·0	40·0	10·0	44·2	38·4	·233	2·7	0·6	80	550	—	—	1·6	3	4	8	16	—	5·8	17	1·47
ECCLES (near Manchester), T. Mackereth, Esq., F.R.A.S., F.M.S.	145	Jan.	29·805	1·298	53·7	28·9	24·8	47·4	36·1	11·3	41·8	38·2	·231	2·7	0·4	88	551	50·0	29·1	0·7	5	0	11	15	—	6·6	20	3·26
		Feb.	29·807	1·706	54·2	20·3	33·9	45·3	32·6	12·7	38·7	35·2	·206	2·4	0·4	88	554	51·9	27·9	0·4	5	3	12	8	—	6·0	14	1·46
		Mar.	29·974	1·210	60·7	14·9	45·8	51·4	37·0	14·4	43·8	39·7	·244	2·8	0·5	86	552	60·3	30·2	1·0	7	4	7	13	—	7·0	21	2·99
MOOR SIDE OBSERVATORY, HALIFAX (Yorkshire), Louis J. Crossley, Esq., F.M.S.	429	Jan.	29·421	1·354	51·6	29·4	22·2	45·9	36·3	9·6	40·9	35·5	·207	2·4	0·6	82	545	52·8	32·0	—	4	0	4	23	3·0	7·0	17	2·92
		Feb.	29·467	1·600	51·4	20·0	31·4	43·6	32·4	11·2	37·7	32·2	·183	2·1	0·6	81	549	61·4	27·6	—	5	5	6	12	3·0	7·3	12	1·08
		Mar.	29·607	1·210	57·4	18·7	38·7	49·1	37·5	11·6	42·3	34·0	·198	2·3	0·8	75	547	72·5	32·0	—	6	4	4	17	4·7	6·6	16	3·79
BERMERSIDE OBSERVATORY, HALIFAX (Yorkshire), Edward Crossley, Esq., F.R.A.S.	520	Jan.	29·337	1·404	51·0	27·0	24·0	44·1	35·7	8·4	41·2	35·4	·207	2·4	0·6	80	543	65·0	28·8	1·0	2	1	10	18	—	7·7	20	3·02
		Feb.	29·421	1·608	53·3	19·6	33·7	43·3	32·0	11·3	37·1	35·3	·206	2·4	0·2	94	549	69·9	25·4	0·6	4	5	7	12	—	7·2	11	1·33
		Mar.	29·551	1·216	57·0	11·9	45·1	48·8	35·4	13·4	41·3	38·1	·231	2·6	0·4	90	546	84·1	28·8	1·4	5	4	7	15	—	6·5	13	3·89
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	Jan.	29·932	1·274	52·0	25·0	27·0	45·2	34·8	10·4	40·5	35·3	·206	2·4	0·6	82	555	57·0	31·4	—	-	-	-	-	—	—	11	1·17
		Feb.	29·973	1·576	52·0	20·0	32·0	43·7	33·1	10·6	39·7	35·8	·210	2·4	0·4	86	556	58·6	30·3	—	-	-	-	-	—	—	16	1·46
		Mar.	30·093	1·365	61·0	16·0	45·0	50·9	34·6	16·3	43·2	38·4	·232	2·7	0·5	83	554	74·0	31·5	—	-	-	-	-	—	—	14	1·27
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	363	Jan.	29·545	1·303	52·0	26·8	25·2	46·0	36·4	9·6	41·2	38·5	·233	2·7	0·3	91	546	73·3	31·6	—	1	0	14	16	—	7·8	25	5·26
		Feb.	29·558	1·733	52·0	22·3	29·7	44·3	32·9	11·4	38·3	34·5	·200	2·3	0·4	87	550	80·1	27·5	—	7	4	8	9	—	6·4	22	1·78
		Mar.	29·722	1·235	56·7	11·1	45·6	49·4	36·9	12·5	42·7	39·0	·237	2·7	0·4	86	548	96·9	32·0	—	3	5	7	16	—	7·5	26	6·46
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	Jan.	29·518	1·390	53·0	30·6	22·4	47·4	38·0	9·4	42·7	39·0	·237	2·7	0·4	86	544	52·8	—	1·2	4	1	3	23	—	5·2	16	2·21
		Feb.	29·565	1·614	51·0	21·1	29·9	44·1	32·1	12·0	38·1	34·1	·196	2·3	0·5	86	551	53·4	—	0·7	-	-	-	-	—	6·1	9	0·96
		Mar.	29·734	1·246	57·4	21·8	35·6	49·7	37·8	11·9	42·8	38·8	·256	2·7	0·5	86	548	66·0	—	0·8	-	-	-	-	—	5·3	12	2·64
LEEDS PHILOSOPHICAL HALL (Yorkshire), Louis C. Miall, Esq.	137	Jan.	29·771	1·336	54·0	28·0	26·0	46·9	36·4	10·5	42·5	38·1	·231	2·6	0·4	85	549	51·3	—	1·2	8	1	8	10	—	7·6	17	1·54
		Feb.	29·815	1·650	55·0	21·0	32·0	44·8	32·7	12·1	39·3	34·0	·196	[illegible]	[illegible]	[illegible]	[illegible]	51·2	—	1·0	[illegible]	[illegible]	10	11	—	6·1	11	[illegible]
		Mar.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Names of Stations and Observers.	Height of Station above Sea Level.	Months.	Atmosphere in Month. Mean.	Atmosphere in Month. Range.	Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Air.	Dew Point.	Elastic Force.	In a cubic foot of Air. Mean.	In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat. = 100.	Mean Weight of cubic foot of Air.	Thermometer. Maximum in Rays of Sun.	Thermometer. Minimum on Grass.	Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount Ozone.	Mean Amount Cloud.	Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
ALLENHEADS (Northumberland), Mr. S. Kidd, Assistant to W. B. Beaumont, Esq., M.P.	1360	Jan.	28.378	1.272	47.0	24.0	23.0	43.0	32.1	10.9	37.2	35.3	.206	2.4	0.2	93	529	62.7	31.0	1.8	7	2	7	15	—	7.3	22	4.56
		Feb.	28.386	1.476	44.0	20.0	24.0	41.5	28.3	13.2	34.4	30.6	.171	2.1	0.3	85	533	61.9	25.9	1.6	4	10	8	6	—	5.8	13	2.59
		Mar.	28.562	1.232	57.0	10.0	47.0	46.5	32.6	13.9	38.5	34.0	.197	2.1	0.4	85	532	75.4	30.6	1.8	4	4	9	14	—	5.7	23	4.09
SILLOTH RECTORY (Cumberland), Rev. Francis Redford, M.A., F.R.A.S., F.M.S.	28	Jan.	29.825	1.445	50.5	31.5	19.0	46.7	39.1	7.6	43.0	37.5	.224	2.6	0.6	80	550	66.8	34.6	1.9	2	1	8	20	10.4	6.1	19	4.06
		Feb.	29.865	1.757	55.6	23.8	31.8	48.0	34.8	13.2	41.0	34.9	.202	2.3	0.7	79	553	72.7	30.8	1.3	6	5	8	9	7.6	5.0	11	2.04
		Mar.	30.022	1.473	61.5	25.9	35.6	52.5	39.2	13.3	45.1	39.7	.244	2.8	0.6	81	551	80.7	35.2	1.8	6	2	6	17	9.4	6.3	15	1.99
CARLISLE (Cumberland), J. Cartmell, Esq., F.M.S.	114	Jan.	29.730	1.358	52.8	27.1	25.7	46.6	36.4	10.2	41.4	38.5	.233	2.7	0.3	90	549	55.5	32.3	2.5	1	2	5	23	7.0	6.7	15	3.36
		Feb.	29.804	1.696	52.5	23.4	29.1	45.8	32.2	13.6	38.7	35.2	.206	2.4	0.4	88	554	64.8	27.4	1.5	4	4	13	7	5.6	6.0	12	2.37
		Mar.	29.954	1.490	58.8	18.5	40.3	50.9	36.9	14.0	43.3	39.2	.240	2.7	0.5	85	552	77.8	32.1	2.5	4	5	5	17	7.5	5.9	15	2.14
BYWELL (Northumberland), Mr. John Dawson, Assistant to W. B. Beaumont, Esq., M.P.	87	Jan.	29.704	1.294	53.0	29.0	24.0	47.5	37.2	10.3	42.2	35.3	.207	2.4	0.7	78	549	50.9	29.8	1.5	8	1	5	17	—	5.4	16	2.65
		Feb.	29.800	1.642	53.0	23.0	30.0	46.8	33.8	13.0	39.8	35.4	.207	2.2	0.6	78	553	55.0	26.6	1.0	4	5	6	13	—	5.5	15	2.28
		Mar.	29.918	1.398	61.0	20.0	41.0	53.0	38.4	14.6	44.5	36.2	.215	2.5	0.8	72	550	65.6	31.6	1.5	7	4	4	16	—	5.1	22	1.47
NORTH SHIELDS (Northumberland), Robert Spence, Esq.	124	Dec.	29.978	1.201	55.0	27.5	27.5	48.9	38.8	10.1	44.0	38.3	.213	2.5	0.8	73	552	—	35.7	1.6	10	0	3	18	—	5.9	10	0.29
		Jan.	29.732	1.301	52.0	28.0	24.0	46.4	36.2	10.2	41.1	35.2	.206	2.4	0.6	80	550	—	34.2	1.7	10	0	4	17	—	4.8	11	1.50
		Feb.	29.840	1.475	50.0	22.7	27.3	42.8	33.3	9.5	37.5	35.3	.207	2.4	0.2	92	556	—	31.6	1.5	6	3	7	12	—	5.7	20	0.96
		Mar.	29.916	1.407	58.5	20.6	37.9	49.9	37.9	12.0	43.3	37.2	.223	2.6	0.6	79	551	—	36.3	2.0	8	4	4	15	—	5.5	20	1.04
MILTOWN (Banbridge, Ireland), John Smyth, Esq., jun., M.A., M.I.C.E.I.	200	Jan.	29.662	1.385	54.0	30.0	24.0	47.1	36.3	10.8	41.6	37.8	.228	2.6	0.4	87	548	56.8	29.9	2.0	2	1	18	10	—	5.5	17	1.74
		Feb.	29.634	1.940	52.0	22.0	30.0	46.6	35.5	11.1	41.0	37.2	.221	2.6	0.4	86	548	69.6	29.4	2.0	3	7	14	4	—	5.0	12	1.78
		Mar.	29.790	1.540	59.0	20.0	39.0	51.8	39.4	12.4	45.1	39.7	.245	2.8	0.7	81	547	86.5	33.5	2.5	4	1	16	10	—	5.1	16	1.34

Note.—*The Barometer Reading*, St. John's College, Battersea, 10th January, 9h. a.m., 28.840 in., has been altered to 29.840 in.
" Allenheads, 16th January, 9h. a.m., 27.742 in., " 28.742 in.
" Portsmouth, 6th March, 3h. p.m., 29.788 in., " 30.788 in.
" Carlisle, 7th ", 5h. p.m., 29.350 in., " 30.350 in.
" Llandudno, 19th ", 9h. p.m., 30.850 in., " 29.850 in.
" St. John's College, Battersea, 31st ", 3h. p.m., 30.884 in., " 29.884 in.

Second Rain-gauges are placed—

			January.		February.		March.		Total during the Quarter.
At Eastbourne, at the height of	160 feet	*above the sea*, the amount collected was	2.58 inches.	–	1.27 inches.	–	0.51 inches.	–	4.36 inches.
" Beachy Head, "	515 feet	" "	1.96 "	–	0.75 "	–	0.81 "	–	3.52 "
" " " "	495 feet	" "	1.32 "	–	1.21 "	–	0.61 "	–	3.14 "
" Portsmouth, "	20 feet	*above the ground*, "	1.32 "	–	1.60 "	–	0.30 "	–	3.22 "
" Strathfield Turgiss, "	38 feet	" "	1.52 "	–	1.33 "	–	0.29 "	–	3.14 "
" Eccles (Manchester), "	34 feet	" "	2.34 "	–	1.17 "	–	2.30 "	–	5.81 "
" Carlisle, "	3 feet	" "	1.31 "	–	1.01 "	–	1.64 "	–	3.96 "
" Miltown (Ireland), "	40 feet	" "	1.44 "	–	1.07 "	–	1.15 "	–	3.66 "
" Oxford, "	22 feet	" "	2.14 "	–	1.53 "	–	0.38 "	–	4.05 "
" Marlborough College, "	8 inches	" "	3.65 "	–	2.53 "	–	0.88 "	–	7.06 "
" " "	1 foot	" "	3.76 "	–	2.43 "	–	0.87 "	–	7.06 "
" Cardington, "	36 feet	" "	1.25 "	–	1.00 "	–	0.44 "	–	2.69 "
" Nottingham, "	39 feet	" "	1.21 "	–	1.53 "	–	0.88 "	–	3.62 "
" Wisbech, "	8 feet	" "	1.26 "	–	0.85 "	–	1.07 "	–	3.18 "
" Aldershot Camp, "	25 feet	" "	1.41 "	–	1.78 "	–	0.37 "	–	3.56 "

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	WIND. Mean Estimated Strength.	WIND. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°						
Guernsey - - -	29·878	60·0	27·0	33·0	49·8	41·1	24·7	8·7	45·1	41·2	·260	3·0	0·5	87	549	—	—	1·4	6	5	9	10	3·9
Helston - - -	29·873	60·0	27·0	33·0	53·5	42·2	26·0	11·3	47·6	41·6	·263	3·2	0·8	80	547	64·6	38·1	1·9	7	6	7	10	4·7
Truro - - -	29·858	58·0	28·0	30·0	51·3	41·3	25·7	10·0	45·7	40·6	·253	2·9	0·6	83	551	—	—	2·7	8	4	5	13	—
Osborne - - -	29·836	62·3	23·7	38·6	49·4	36·6	31·0	12·8	42·8	40·3	·250	2·9	0·3	91	551	68·2	28·3	0·2	5	4	8	13	—
Bournemouth - -	—	58·0	25·3	32·7	48·3	38·1	26·6	10·2	43·0	38·9	·238	2·8	0·4	85	555	—	—	—	9	4	5	12	—
Portsmouth - -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	66·9	33·2	2·0	4	4	9	13	2·0
Worthing - - -	29·861	58·5	23·4	35·1	48·6	37·9	29·0	10·7	43·0	39·2	·244	2·8	0·4	87	554	76·3	—	0·9	7	4	6	13	3·0
Taunton - - -	29·851	61·0	15·5	45·5	50·0	36·8	34·2	13·2	43·4	39·9	·247	2·8	0·4	88	552	56·4	33·1	0·4	9	4	6	12	5·4
Wilton House - -	29·876	68·0	20·0	48·0	51·0	32·5	38·8	18·5	41·6	38·9	·238	2·7	0·3	91	553	80·8	29·9	1·3	5	6	8	11	—
Barnstaple - -	29·830	60·0	27·0	33·0	50·4	40·3	27·3	10·1	45·3	41·4	·261	3·0	0·4	87	551	—	—	1·3	5	4	10	12	—
Aldershot Camp -	29·846	67·2	22·0	45·2	48·9	34·5	33·4	14·5	40·7	37·7	·226	2·6	0·3	89	550	75·6	30·1	1·6	5	2	10	13	1·8
Ramsgate - - -	29·860	61·0	24·0	37·0	48·2	36·9	29·5	11·3	42·9	39·9	·248	2·9	0·3	90	553	83·7	33·7	1·6	7	4	7	12	—
Strathfield Turgiss -	29·886	64·7	22·6	42·1	48·3	34·9	31·2	13·4	41·4	37·6	·226	2·6	0·4	91	551	79·9	30·2	0·7	6	4	7	12	4·4
Weybridge Heath -	29·916	67·5	19·5	48·0	48·2	35·2	36·1	13·0	41·2	37·6	·226	2·6	0·5	88	554	67·6	31·6	0·8	5	5	14	6	1·4
Marlborough College	29·895	61·0	21·3	39·7	47·4	33·9	32·8	13·5	40·3	37·3	·224	2·6	0·3	89	549	79·7	32·5	—	7	4	8	12	—
Royal Observatory -	29·878	65·4	21·0	44·4	48·4	35·4	34·9	13·0	41·4	36·8	·219	2·5	0·5	84	553	74·2	29·7	0·6	5	3	9	13	—
Streatley Vicarage -	29·873	68·8	18·4	50·4	49·3	35·5	36·3	13·8	42·6	38·8	·236	2·8	0·5	87	552	55·8	—	1·6	7	2	8	13	—
St. John's Col., Battrs.	29·820	66·0	21·0	45·0	49·0	31·0	37·0	18·0	42·0	39·4	·242	2·8	0·4	90	555	61·6	25·9	1·6	2	4	12	12	—
Camden Town - -	29·873	65·4	21·9	43·5	48·5	35·4	34·3	13·1	41·9	38·0	·229	2·6	0·5	87	554	62·1	33·2	—	8	2	7	14	—
Chiswick - - -	29·875	60·5	21·2	39·3	49·0	35·4	34·1	13·6	41·7	36·4	·215	2·5	0·6	81	555	73·6	32·9	—	5	4	10	11	—
Leicester - - -	29·839	64·4	18·5	45·9	47·3	35·3	34·6	12·0	41·2	37·0	·220	2·5	0·4	86	552	78·0	30·0	1·0	3	3	12	12	—
Oxford - - -	29·869	63·6	22·8	40·8	48·0	36·2	31·8	11·8	42·1	37·5	·225	2·6	0·5	84	551	81·0	34·3	1·2	5	4	8	13	2·3
Gloucester - -	29·884	61·9	21·0	40·9	49·5	36·5	32·3	13·0	42·8	38·1	·230	2·6	0·5	83	550	72·4	32·9	0·9	7	3	8	12	1·1
Royston - - -	29·885	66·7	14·6	52·1	48·3	33·9	39·1	14·4	40·9	36·8	·218	2·5	0·4	85	552	—	—	—	5	3	9	13	—
Cardington - -	29·861	66·0	19·6	46·4	48·0	33·8	37·1	14·2	40·9	38·0	·229	2·6	0·3	89	557	58·1	26·8	2·0	5	2	8	14	—
Somerleyton Rectory	29·835	65·2	17·5	47·7	47·9	33·7	36·8	14·2	40·5	34·2	·231	2·7	0·2	92	556	—	24·6	1·0	4	3	11	12	6·6
Norwich - - -	29·820	64·5	19·0	45·5	46·5	33·2	35·2	13·3	39·8	38·2	·231	2·7	0·2	94	556	—	—	—	3	3	10	13	—
Wisbech - - -	29·817	68·0	19·4	48·6	48·1	34·5	36·6	13·6	41·0	38·0	·230	2·6	0·3	89	555	75·1	30·4	0·7	3	4	11	12	—
Llandudno - -	29·771	59·4	26·2	33·2	50·0	38·7	27·2	11·3	44·4	39·1	·240	2·8	0·6	83	549	—	—	0·8	3	1	5	21	—
Derby - - -	29·816	67·0	21·0	46·0	48·0	35·7	36·0	12·3	41·2	36·4	·215	2·5	0·5	83	552	—	—	—	5	2	7	16	—
Holkham - - -	29·815	65·5	17·0	48·5	46·4	31·7	35·7	14·7	39·9	34·7	·201	2·3	0·6	82	556	76·4	27·1	1·5	4	3	14	9	—
Eccles - - -	29·795	60·7	14·9	45·8	48·0	35·2	34·8	12·8	41·4	37·7	·227	2·6	0·4	87	552	54·1	29·1	0·7	6	2	10	12	—
Moorside, Halifax -	29·781	57·4	18·7	38·7	46·2	35·4	30·8	10·8	40·3	33·9	·196	2·3	0·7	79	547	62·2	30·5	—	5	3	5	17	3·6
Bermerside, Halifax	29·795	57·0	11·9	45·1	45·4	34·4	34·3	11·0	39·9	36·3	·215	2·5	0·4	88	546	73·0	27·7	1·0	4	3	8	15	—
Hull - - -	29·794	61·0	16·0	45·0	46·6	34·2	34·7	12·4	41·1	36·5	·216	2·5	0·5	84	555	63·2	31·1	—	—	—	—	—	—
Stonyhurst - -	29·806	56·7	11·1	45·6	46·6	35·4	33·5	11·2	40·7	37·3	·223	2·6	0·4	88	548	83·4	30·4	—	4	3	10	14	—
Bradford - - -	29·722	57·4	21·1	36·3	47·1	36·0	29·3	11·1	41·2	37·3	·223	2·6	0·5	86	548	57·1	—	0·9	—	—	—	—	—
Cockermouth - -	29·724	58·2	21·5	36·7	47·1	37·2	28·6	9·9	41·9	38·4	·233	2·7	0·4	88	550	67·0	28·2	0·5	4	4	12	10	3·1
Allenheads - -	29·706	57·0	10·0	47·0	43·7	31·0	31·3	12·7	36·7	33·3	·191	2·2	0·3	88	531	66·7	29·2	1·7	5	5	8	12	—
Silloth - - -	29·712	61·5	23·8	37·7	49·1	37·7	28·8	11·4	43·0	37·4	·223	2·6	0·6	80	551	73·4	33·5	1·7	5	3	7	15	9·1
Carlisle - - -	29·730	58·8	18·5	40·3	47·8	35·2	31·7	12·6	41·1	37·6	·226	2·6	0·4	88	552	66·0	30·6	2·2	3	4	8	16	6·7
Bywell - - -	29·690	61·0	20·0	41·0	49·1	36·5	31·7	12·6	42·2	35·6	·210	2·4	0·7	76	551	57·2	29·3	1·3	6	3	5	15	—
North Shields - -	—	58·5	20·6	37·9	46·4	35·8	29·7	10·6	40·6	35·9	·212	2·5	0·5	84	552	—	34·0	1·7	8	2	5	15	—
Miltown (Ireland) -	29·682	59·0	20·0	39·0	48·5	37·1	31·0	11·4	42·6	38·2	·231	2·7	0·5	85	548	71·0	30·9	2·2	3	3	16	8	—

The highest temperatures of the air were at Streatley Vicarage, 68°·8; Wilton House and Wisbech, 68°·0 respectively; Heath, 67°·5; Aldershot Camp, 67°·2; Derby, 67°·0; Royston, 66°·7; and at Battersea and Cardington, 66°·0 respectively.

The lowest temperatures of the air were at Allenheads, 10°·0; Stonyhurst, 11°·1; Bermerside, Halifax, 11°·9; Royston, 14°·9; Taunton, 15°·5; Hull, 16°·0; Holkham, 17°·0; and at Somerleyton Rectory, 17°·5.

The greatest daily ranges of the temperatures of the air were at Wilton House, 18°·5; Battersea, 18°·0; Holkham, 14°·1 Camp, 14°·5; Royston, 14°·4; and at Cardington, 14°·2.

The least daily ranges of the temperatures of the air were at Guernsey, 8°·4; Cockermouth, 9°·9; Truro, 10°·0; Barnst Bournemouth, 10°·2; North Shields, 10°·6; Worthing, 10°·7; Moorside, Halifax, 10°·8; and at Bermerside, Halifax, 11°·0.

The greatest numbers of rainy days were at Stonyhurst, 73; Truro and Allenheads, 58 respectively; Eccles, 55; Bywell, mouth and North Shields, 51 respectively; Oxford, 48; Helston and Marlborough College, 47 respectively; and at Guernsey an 46 respectively.

The least numbers of rainy days were at Norwich and Holkham, 30 respectively; Royal Observatory and Battersea, 32 r Worthing and Cardington, 33 respectively; and at Bournemouth, 35.

The heaviest falls of rain were at Stonyhurst, 13·50 inches; Allenheads, 11·24 inches; Cockermouth, 11·15 inches; Truro, 1 Helston, 9·17 inches; Barnstaple, 8·94 inches; and at Bermerside, Halifax, 8·24 inches.

The least falls of rain were at the Royal Observatory, 2·39 inches; Camden Town, 2·48 inches; Norwich, 2·63 inches 2·97 inches; Somerleyton Rectory, 2·98 inches; and at Weybridge Heath, 3·20 inches.

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	WIND. Mean Estimated Strength.	WIND. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°						
Guernsey - - - -	29·878	60·0	27·0	33·0	49·8	41·1	24·7	8·7	45·1	41·2	·260	3·0	0·5	87	549	—	—	1·4	6	5	9	10	3·9
Between the latitudes 50° and 51° -	29·864	59·4	25·5	33·9	50·2	39·2	27·7	11·0	44·4	40·1	·249	2·9	0·5	85	552	69·0	33·2	1·5	7	4	7	12	3·2
51° and 52° -	29·870	64·3	21·1	43·2	48·8	35·3	33·8	13·5	42·0	38·3	·232	2·7	0·4	87	552	72·1	31·3	1·1	6	4	9	12	3·1
52° and 53° -	29·834	64·9	19·5	45·4	48·1	34·6	35·1	13·5	41·3	37·5	·225	2·6	0·4	87	554	70·5	28·4	1·1	5	3	9	13	3·6
53° and 54° -	29·782	58·4	15·6	42·8	46·7	35·1	32·9	13·6	40·8	36·5	·217	2·5	0·5	85	549	65·5	29·8	0·9	5	3	8	14	—
54° and 55° -	29·712	59·3	18·8	40·5	47·4	35·5	30·4	11·9	41·0	36·5	·217	2·5	0·4	84	549	66·1	30·2	1·5	5	4	8	13	6·3
North Shields - - -	—	58·5	20·6	37·9	46·4	35·8	29·7	10·6	40·6	35·9	·212	2·5	0·5	84	552	—	34·0	1·7	8	2	5	15	—
Miltown, Banbridge (Ireland) -	29·682	59·0	20·0	39·0	48·5	37·1	31·0	11·4	42·6	38·2	·231	2·7	0·5	85	548	71·0	30·9	2·2	3	3	16	8	—
Mean for the Quarter, 50° to 55° Year 1871	29·713	67·0	14·1	52·9	46·2	34·6	34·2	11·6	40·1	36·2	·216	2·5	0·4	86	551	63·4	28·1	1·2	5	6	9	10	—
" 1872	29·454	61·2	25·2	36·0	49·3	38·0	28·7	11·3	43·3	39·4	·243	2·8	0·5	87	544	69·6	22·8	1·0	4	5	13	9	4·5
" 1873	29·650	63·3	20·5	42·8	45·7	34·7	31·1	11·0	39·8	35·9	·216	2·5	0·4	86	551	63·4	29·6	1·1	7	7	8	8	[illegible]
" 1874	29·812	61·3	20·1	41·2	48·2	35·9	32·0	12·3	41·9	37·8	·228	2·6	0·4	86	551	68·6	30·6	1·2	6	4	8	13	[illegible]

METEOROLOGY OF ENGLAND,
DURING THE QUARTER ENDING JUNE 30, 1874.

REMARKS ON THE WEATHER DURING THE QUARTER ENDING JUNE 30TH, 1874.

By JAMES GLAISHER, ESQ., F.R.S., *&c.*

The warm period which set in on 13th March (the excess of the daily temperature of which over daily averages till the end of March was 5¼°) continued with very slight exceptions throughout April, the average daily excess of temperature for this month being 4°. On several days towards the end of the month the days were very warm, the excesses being as large as 10° to 13°. On 1st May a cold period set in, and continued without exception till the 21st; these three weeks of low temperature were very painful, following so immediately the heat of the preceding seven weeks. A period of warm weather then occurred from 22nd May to 11th June, the average daily excess of temperature being 4⅓°, and from this time to the end of the quarter low temperatures prevailed, the deficiency of daily temperature amounting to nearly 4½°.

The mean temperature of April at Greenwich was 6°·3 higher than that of March; that of May was only 0°·5 higher than that of April, while that of June was 7°·5 above that of May. (From preceding 33 years' observations the mean temperature of April is higher than that of the March by 5°·5, that of May higher than that of April by 5°·8, and that of June than that of May by 6°·1).

The mean temperature of April above that of March over the whole country was 5⅓° nearly; the mean temperature of May was at many places lower than that of April, but taking the mean of all, the excess over April was 0°·2. The excess of June over May, obtained from all the stations was 7½° nearly, the increase at southern stations being about a degree less than this amount, and at northern stations about a degree more.

The readings of the barometer at 159 feet above sea level were variable, but generally below their averages from the 1st to the 14th of April; the lowest reading in the month being 29·0 ins. on the 11th. From the 15th to the 28th, a steady increase was experienced, and the maximum 30·2 ins. (the highest reading in the month) was attained on the last named day. Throughout the month of May the reading of the barometer was alternately above and below its average, the highest reading being 30·2 ins. on the 16th, and the lowest 29·3 ins. on the 23d.

In June the barometer reading was above its average from the 1st to 23rd, below from the 24th to the 29th, and again above on the 30th. The highest reading in the month was 30·4 ins. on the 15th, and the lowest was 29·4 ins. on the 26th.

At Greenwich the decrease of atmospheric pressure from March to April was 0·309 in., the increase from April to May was 0·099 in., while that from May to June was 0·136 in. The mean increase from all stations from April to May was 0·307 in., being somewhat larger at southern, and smaller at northern stations; from May to June the increase was 0·132 in. being less than this amount at southern and larger at northern stations, and the further increase from May to June was 0·122 in., the increase being greater than this value at midland stations, and less both at southern and northern stations.

The mean temperature of April was 50°·0 being 4°·0 higher than the average of 103 years, and 2°·9 higher than that of the preceding 33 years. It was higher than in 1873 by 4°·1, and higher than in 1872 by 1°·7.

Going back to the year 1771 there have been but 5 Aprils of so high a temperature as in 1874, viz.:

The year 1779	when the mean temperature of April was	50°·7.
„ 1821	.. ..	50°·4.
„ 1844	„ „	51°·7.
„ 1865	„ „	52°·3.
„ 1869	„ „	50°·3.

The mean temperature of May was 50°·5, being 2°·0 lower than the average of 103 years, and 2°·4 lower than that of the preceding 33 years, it was 0°·1 and 0°·4 colder than in 1873 and 1872 respectively.

The mean temperature of June was 58°·0 being respectively 0°·2 and 1°·0 lower than the averages of 103 years, and the preceding 33 years; it was 0°·9 below the corresponding value for 1873, and 1°·2 below that of 1872.

The mean temperature of the quarter was 52°·8, the average temperature for the second 3 months of the year as deduced from the previous 103 years is 52°·2, and as deduced from the preceding 33 years 53°·0; showing that the excess of temperature for the quarter over the former is 0°·6, and the defect below the latter 0°·2.

The mean high day temperatures were 3°·7 and 0°·1 higher than their respective averages in April and June, and 1°·3 lower in May.

The mean low night temperatures were respectively 3°·3 and 1°·7 below their averages in May and June, and 2°·1 above in April.

The mean daily ranges of temperature were greater than their respective averages in April, May, and June by 1°·7, 2°·0, and 1°·8 respectively.

The fall of rain in April was 1·4 inches, being 0·3 inch below the average, in May it was 0·4 inch only, and in June it was 2·4 inches, being 0·5 inch above the average.

Since the year 1815 there have been 9 Mays with falls of rain of less than one inch, viz., the fall

In the year 1823 was 0·8.	In the year 1844 was 0·4.	In the year 1857 was 0·6.
„ 1829 „ 0·6.	„ 1848 „ 0·4.	„ 1870 „ 0·5.
„ 1833 „ 0·2.	„ 1851 „ 0·8.	„ 1871 „ 0·6.

This continued deficiency of rain is very remarkable, and it seems to be general over the whole country, at Greenwich the fall of rain

In the 4 months ending April was 3·79 inches, being 2·96 inches less than the average.
„ 5 „ „ April „ 4·09 „ „ 4·66 „ „
In the 5 months ending May was 4·19 inches, being 4·70 inches less than the average.
„ 6 „ „ May „ 4·49 „ „ 6·40 „ „
In the 6 months ending June was 6·59 inches, being 4·23 inches less than the average.
„ 7 „ „ June „ 6·89 „ „ 5·93 „ „

E. & S.—550.—8/74.

Back to the year 1815:—In the 4 months ending April, there is only one instance of a smaller fall than in this year, viz., in 1854 when the amount was 3·5 inches.

In the 5 months ending April, there is no instance of so small a fall; the nearest approach was in the year 1854 when the amount was 4·3 inches.

In the 5 months ending May, there is no instance of so small a fall; the nearest approach was in the year 1870, when the amount was 4·9 inches.

In the 6 months ending May, there is no instance of so little rain; the nearest approach was in the year 1847, when the amount was 7·1 inches.

In the 6 months ending June, the fall in the year 1870 was 5·3 inches only, being 1½ inch less than in this year; the nearest smallest amount recorded was in the year 1854, when the amount was 7·0 inches.

In the 7 months ending June, there is no instance of so small a fall; the nearest approach was in the year 1870, when the amount was 8·1 inches being 1·2 inch greater, so that, as far back as trustworthy records extend, the fall of rain from December 1873 to June 1874, both months inclusive, is the smallest on record.

The average duration of the different directions of the wind referred to eight points of the compass, and the duration of each direction in each month in the quarter, were as follows:—

Direction of Wind.	April. Average.	April. 1874.	April. Departure from Average.	May. Average.	May. 1874.	May. Departure from Average.	June. Average.	June. 1874.	June. Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	2¼	2	−¼	1¼	1	−¼	2	1	−1
N.	4	2	−2	4¼	8	+3¾	3¼	3	−¼
N.E.	6	3	−3	7	7	0	3½	8	+4½
E.	3½	5	+1½	2½	4	+1½	2½	4	+1½
S.E.	2	1	−1	1¾	1	−¾	1¾	2	+¼
S.	2½	1	−1½	2¼	1	−1¼	2¼	2	−¼
S.W.	6¾	9	+2¼	7½	4	−3½	10	7	−3
W.	2½	7	+4½	2	5	+3	3¼	3	−¼
Calm, nearly.	1	0	−1	2	0	−2	1½	0	−1½

The + signs denote excesses over averages; in the month of April the largest numbers are opposite to the W. and S.W. winds, in May to the N. and W. winds; and in June to N.E. and E.

The − signs denote defect below averages; in April the largest numbers are opposite to the N. and N.E. winds; in May to the S.W. and S. winds; and in June to the S.W. and N.W. winds.

Thus the prevailing winds in April were W. and S.W.; in May, N. and W., and in June, N.E. and E.

1874. Months.	Temperature of Air. Mean.	Air. Diff. from average of 103 years.	Air. Diff. from average of 33 years.	Evaporation. Mean.	Evaporation. Diff. from average of 33 years.	Dew Point. Mean.	Dew Point. Diff. from average of 33 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 33 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 33 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour. Diff. from average of 33 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
April -	50·0	+4·0	+2·9	46·9	+2·9	43·6	+3·0	20·3	+1·7	50·5	0·284	+0·030	3·3	+0·4
May -	50·5	−2·0	−2·4	46·7	−2·4	42·8	−2·6	22·5	+2·0	54·9	0·275	−0·027	3·2	−0·2
June -	58·0	−0·2	−1·0	53·5	−1·1	49·5	−1·2	22·8	+1·8	62·5	0·355	−0·016	3·9	−0·3
Means -	52·8	+0·6	−0·2	49·0	−0·2	45·3	−0·3	21·9	+1·8	56·0	0·305	−0·004	3·5	0·0

1874. Months.	Degree of Humidity. Mean.	Humidity. Diff. from average of 33 years.	Reading of Barometer. Mean.	Barometer. Diff. from average of 33 years.	Weight of a Cubic Foot of Air. Mean.	Weight. Diff. from average of 33 years.	Rain. Amount.	Rain. Diff. from average of 59 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
April -	79	0	29·704	−0·066	539	−4	1·4	−0·3	306	6	20	4	22·3	47·0
May -	76	0	29·803	+0·023	541	0	0·4	−1·7	226	15	9	7	20·2	51·2
June -	74	0	29·939	+0·128	535	+3	2·4	+0·5	247	1	13	16	26·9	55·0
Means -	76	0	29·815	+0·028	538	0	Sum 4·2	Sum −1·5	Mean 260	Sum 22	Sum 42	Sum 27	Lowest 20·2	Highest 55·0

Note.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the plus sign (+) signifies above the average.

Thunderstorms occurred, on the 3rd of April at Carlisle; on the 4th at Guernsey and Hull; on the 5th at Eccles; on the 6th at Bywell; on the 9th at Stonyhurst; and on the 12th at Hull. On the 3rd of May at Taunton; on the 4th at Guernsey; on the 6th at Liverpool, Eccles, and Leeds; on the 7th at Guernsey, Cardington, and Wisbech; on the 8th at London; on the 9th at Guernsey and Llandudno; on the 21st at London; on the 22d at Weybridge Heath and Cardington; on the 24th at Salisbury and Norwich; on the 25th at Osborne, Aldershot Camp, Weybridge Heath, London, Leicester, Royston, Cardington, and Wisbech; and on the 26th at Osborne. O[illegible] the 2nd of June at Cardington; on the 6th at Strathfield Turgiss; on the 22nd at Cardington, Som[illegible]

wich, and Hull; on the 24th at Helston, Taunton, Weybridge Heath, Strathfield Turgiss, ǃoyston, Cardington, Norwich, Eccles, Hull, Stonyhurst, and North Shields; on the 25th ;ton, Norwich, Hull, Silloth, and Miltown; on the 26th at Halifax and Allenheads; on Halifax, Allenheads, and Miltown; and on the 29th at North Shields and Miltown.

was heard, but lightning was not seen in April on 7 days; in May on 12 days, and in days.

' *was seen, but thunder was not heard,* on the 3rd of April at Silloth, on the 4th at ı and Stonyhurst; and the 12th at Allenheads. On the 7th of May at Hastings; on Helston and Llandudno; on the 9th at Portsmouth and Hastings; on the 11th at and on the 29th at Helston. On the 4th of June at Hastings; on the 8th at Wey- th; on the 10th at Guernsey; and on the 26th at Carlisle.

los were seen, on the 1st, 2nd, 3rd, and 4th of April at Halifax; on the 5th at Oxford; at Portsmouth, Oxford, and Halifax; on the 10th at Portsmouth, Oxford, and Halifax; h at Portsmouth and Oxford; on the 15th at Oxford and Halifax; on the 17th at on the 19th at Carlisle; on the 22nd and 24th at Halifax; and on the 28th at Ports- n the 2nd, 5th, 8th, 10th, 14th, and 17th of May at Halifax; on the 21st at Oxford ster; on the 27th at Halifax; on the 28th at Wisbech; and on the 30th at Halifax. of June at Halifax; on the 3rd at Oxford and Halifax; on the 4th at Liverpool and n the 6th at Oxford and Halifax; on the 9th, 10th, 13th, and 22nd at Halifax; on the ;ybridge Heath, Oxford, and Halifax; on the 26th at Halifax; on the 28th at Oxford ɛ; and on the 29th at Halifax.

ılos were seen, on the 3rd, 19th, and 22nd of April at Halifax; on the 23rd at Leicester; h at Leicester and Oxford; on the 27th at Leicester and Halifax; and on the 28th uth, Salisbury, and Eccles. On the 20th of June at Oxford; on the 28th at Weybridge l on the 29th at Weybridge Heath, London, and Oxford.

boreales were seen, on the 3rd of June at Oxford and Liverpool; and on the 13th at

l, on the 1st of April at Bradford; on the 2nd at Royston; on the 3rd at Allenheads; at Halifax, Stonyhurst, Carlisle, and Bywell; and on the 13th at Halifax and Allen- the 3rd of May at Allenheads; on the 4th at Halifax and Allenheads; on the 6th at ; on the 7th at Bradford and Allenheads; on the 8th at Hastings, Streatley, and ; on the 9th at Bradford and Allenheads; and on the 10th at Halifax and Allenheads. in April on 11 days, in May on 11 days, and in June on the 23rd at Guernsey, and at Weybridge, Streatley, Oxford, Royston, Cardington, Hull, and North Shields.

ıiled on the 10th of April at Gloucester; on the 11th at North Shields; on the 12th at n the 15th at London; on the 19th and 20th at Helston; on the 21st at Guernsey, d North Shields; on the 23rd at North Shields; on the 26th at London, Bywell, and lds; and on the 27th at Bywell and North Shields. On the 14th of May at Allen- the 16th at Miltown; on the 22nd at Allenheads; on the 23rd at Llandudno, Halifax, and ; on the 24th at Hastings, Oxford, Llandudno, Eccles, Halifax, and Allenheads; on t Wisbech, Llandudno, Halifax, Allenheads, and North Shields; on the 26th at Llandudno, Halifax, and Miltown; and on the 28th at Llandudno. On the 5th of June no; on the 7th at London; on the 15th, 16th, and 17th at Allenheads; on the 19th ınd North Shields; and on the 20th at London.

	the earliest,	April 7, at Oxford;	the latest,	May 20, at Hull.
	,,	April 10, at Oxford;	,,	May 20, at Hull.
	,,	April 20, at Guernsey;	,,	May 29, at Hull.
	,,	April 9, at Wisbech;	,,	May 8, at Hull.
	,,	April 6, at Strathfield Turgiss;	,,	May 12, at Hull.
ıut,	,,	April 8, at Wisbech;	,,	May 22, at Hastings.
ɔplar	,,	April 6, at Helston;	,,	April 26, at Hastings.
	,,	April 3, at Osborne;	,,	May 2, at Hull and Silloth.
	,,	April 20, at Miltown;	,,	May 14, at Hull.
	,,	April 10, at Oxford;	,,	April 26, at Weybridge Heath.
m—				
	,,	April 13, at Helston;	,,	April 30, at Miltown.
	,,	June 6, at Strathfield Turgiss;	,,	June 22, at Weybridge Heath.
e,	,,	May 19, at Strathfield Turgiss;	,,	June 23, at Hull.
ısh,	,,	April 27, at Weybridge Heath;	,,	May 25, at Hastings.
	,,	May 24, at Strathfield Turgiss;	,,	June 25, at Hastings.
	,,	April 15, at Helston;	,,	May 15, at Hull.
ɔm,	,,	April 5, at Weybridge Heath;	,,	May 3, at Hull.
le,	,,	April 19, at Oxford;	,,	April 30, at Hull.
,	,,	April 14, at North Shields;	,,	April 25, at Strathfield Turgiss.
	,,	April 4, at Silloth;	,,	April 20, at Hastings.
	,,	April 3, at Silloth;	,,	April 10, at Hull.
—				
	,,	June 7, at Weybridge Heath;	,,	June 26, at Hull.
	,,	June 6, at Strathfield Turgiss;	,,	June 15, at Cockermouth.
	,,	June 4, at Helston;	,,	June 24, at Cockermouth.
	,,	June 8, at Helston;	,,	June 25, at Cockermouth.
	,,	April 1, at Osborne;	,,	May 5, at Truro.
	,,	April 18, at Royston;	,,	April 23, at Cardington.
	,,	April 11, at Bywell;	,,	April 29, at Helston.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING JUNE 30TH, 1874.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean. Of all Highest.	Temperature of Air in Month. Mean. Of all Lowest.	Temperature of Air in Month. Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat° = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY. Samuel Elliott Hoskins, Esq., M.D., F.R.S., F.M.S.	204	April	29·683	1·132	70·0	39·0	31·0	56·5	46·0	10·5	49·6	45·3	·304	3·5	0·5	86	540	—	—	1·3	8	6	7	9	3·8	3·6	12	3·63
		May	29·770	0·862	67·5	39·0	28·5	57·7	46·5	11·2	50·4	45·9	·307	3·5	0·6	86	540	—	—	1·0	13	5	3	10	3·8	3·6	9	0·94
		June	29·883	0·920	69·0	49·5	19·5	62·9	52·6	10·3	55·3	51·5	·380	4·3	0·7	87	537	—	—	1·3	11	8	4	7	4·0	4·6	7	1·13
HELSTON (Cornwall). Matthew P. Moyle, Esq., M.R.C.S.	106	April	29·787	1·063	70·0	35·0	35·0	60·2	45·6	14·6	51·7	44·4	·293	3·5	1·1	76	538	82·7	40·7	2·1	6	7	6	11	4·9	4·3	14	2·12
		May	29·905	0·846	74·0	34·0	40·0	63·2	47·2	16·0	54·0	43·9	·287	3·4	1·6	68	536	93·8	41·0	2·1	11	5	6	9	4·2	3·2	9	1·23
		June	30·004	0·968	76·0	45·0	31·0	69·4	55·1	14·3	59·9	50·2	·364	4·2	1·8	71	531	102·1	47·0	2·1	9	5	7	9	4·2	3·4	8	2·06
TRURO (Cornwall). C. Barham, Esq., M.D., F.M.S.	43	April	29·845	1·046	70·0	30·0	40·0	58·0	44·7	13·3	51·4	42·2	·270	3·0	1·2	71	541	—	—	2·8	6	8	5	11	—	5·9	14	1·97
		May	29·960	0·825	69·0	31·0	38·0	61·0	43·0	18·0	50·8	43·0	·278	3·2	1·0	75	543	—	—	2·4	12	8	4	7	—	6·4	10	1·34
		June	30·096	0·897	75·0	41·0	34·0	67·8	50·3	17·5	57·1	49·6	·355	4·0	1·3	75	539	—	—	2·3	9	9	7	5	—	5·4	8	1·84
SIDMOUTH (Devon). J. Ingleby Mackenzie, Esq., M.B., F.M.S.	30	April	29·856	1·246	65·5	32·9	32·6	56·6	43·1	13·5	48·8	45·8	·310	3·6	0·6	90	544	—	—	1·1	6	5	10	9	—	2·5	13	2·02
		May	29·972	0·885	68·3	34·8	33·5	59·2	43·5	15·7	49·9	45·6	·304	3·4	0·8	85	544	—	—	1·2	7	4	11	9	—	2·9	9	1·30
		June	30·102	0·924	75·8	40·0	35·8	65·6	50·3	15·3	57·0	49·5	·353	3·9	1·3	76	539	—	—	1·8	4	9	11	6	—	3·0	6	1·85
OSBORNE (Isle of Wight). J. R. Mann, Esq.	172	April	29·708	1·122	73·8	34·2	39·6	60·0	43·0	17·0	49·9	46·2	·314	3·5	0·5	88	540	97·8	38·1	0·2	5	7	9	9	—	4·8	12	2·70
		May	29·797	0·872	74·7	35·0	39·7	63·5	43·5	20·0	52·0	46·5	·316	3·6	0·8	82	539	105·9	39·0	0·4	9	9	3	10	—	5·6	11	0·61
		June	29·932	0·906	86·5	42·2	44·3	71·1	50·1	21·0	59·0	54·7	·428	4·8	0·8	86	533	112·6	46·4	0·6	8	12	4	6	—	5·7	12	1·63
PORTSMOUTH. William C. Ellis, Esq.	16	April	29·923	1·128	—	—	—	—	—	—	—	—	—	—	—	—	—	103·3	39·6	2·0	5	9	6	10	4·9	4·6	13	2·62
		May	29·979	0·870	—	—	—	—	—	—	—	—	—	—	—	—	—	110·0	39·7	1·6	6	7	6	12	5·5	6·0	9	1·21
		June	30·071	0·870	—	—	—	—	—	—	—	—	—	—	—	—	—	120·3	47·0	1·5	7	10	7	6	5·0	5·4	10	1·93
WORTHING (Sussex). W. J. Harris, Esq., M.R.C.S.E., L.S.A., F.M.S.	31	April	29·847	1·120	69·0	35·3	33·7	59·2	44·5	14·7	51·0	43·1	·279	3·2	1·2	72	541	105·1	40·2	1·0	6	7	4	13	3·4	5·0	9	1·45
		May	29·945	0·878	68·0	34·4	33·6	59·7	43·3	16·4	50·7	41·9	·276	3·2	0·9	76	543	115·9	39·4	0·5	9	9	6	7	0·8	5·6	7	0·54
		June	30·080	0·869	76·4	40·9	35·5	67·0	50·7	16·3	57·8	48·8	·344	3·8	1·5	71	538	118·6	47·3	0·7	8	10	5	7	2·5	5·1	10	1·99
BRIGHTON (Sussex). Frederick E. Sawyer, Esq., F.M.S.	200	April	29·678	1·101	69·1	35·0	34·1	56·7	43·9	12·8	49·8	41·2	·260	3·0	1·0	73	540	106·7	39·2	1·1	4	4	8	14	—	5·1	11	1·79
		May	29·758	0·930	69·6	34·0	35·6	59·9	43·3	16·6	50·6	40·7	·254	2·9	1·3	69	540	111·2	40·3	0·7	11	5	5	10	—	6·6	7	0·24
		June	29·888	0·887	75·3	39·7	35·6	66·3	50·5	15·8	57·4	48·7	·344	3·8	1·4	65	535	113·8	47·9	0·6	11	11	3	5	—	5·0	10	1·60
MANOR HOUSE (Hastings). Alex. E. Murray, Esq., F.M.S.	174	April	29·722	1·080	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1·3	—	—	—	—	—	5·3	—	—
		May	29·802	0·880	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1·3	11	7	6	7	—	5·7	—	—
		June	29·942	0·864	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1·6	11	7	6	6	—	5·2	—	—
TAUNTON (Somerset). James Bottomley, Esq.	80	April	29·800	1·204	77·0	30·0	47·0	60·2	41·7	18·5	50·3	43·5	·283	3·3	0·9	78	541	71·2	35·9	0·3	8	9	5	8	5·0	5·0	12	2·23
		May	29·918	0·876	76·4	29·5	46·9	64·8	41·1	23·7	51·3	44·6	·296	3·4	0·9	78	542	78·3	53·9	0·3	7	10	7	7	5·3	7·1	10	1·60
		June	30·041	0·964	83·7	31·0	52·7	70·8	47·8	23·0	57·7	48·7	·344	3·8	1·5	71	537	83·6	46·6	0·3	6	6	7	11	—	6·2	8	1·21
WILTON HOUSE (near Salisbury). T. Challis, Esq.	186	April	29·675	1·132	78·5	27·5	51·0	62·4	37·9	24·5	49·5	44·3	·292	3·3	0·7	83	540	100·3	34·7	1·5	4	6	9	11	—	4·8	14	2·06
		May	29·782	0·874	78·0	26·0	52·0	66·4	37·8	28·6	51·0	44·9	·299	3·4	0·8	80	540	116·6	34·0	1·2	9	12	8	2	—	6·3	9	0·76
		June	29·926	0·864	85·0	31·0	54·0	73·4	44·8	28·6	57·6	50·0	·360	4·0	1·3	75	535	118·8	42·4	1·4	6	12	6	6	—	6·1	9	1·22
BARNSTAPLE (Devon). T. Mackrell, Esq.	40	April	29·828	1·250	79·0	35·0	44·0	60·5	46·1	14·4	52·3	45·4	·303	3·4	1·1	77	539	—	—	1·1	5	5	8	12	—	5·0	11	1·89
		May	29·942	0·850	71·0	34·0	37·0	63·8	47·2	16·6	54·6	46·0	·309	3·7	1·2	73	539	—	—	1·0	12	4	6	9	—	4·0	9	0·70
		June	30·089	0·940	72·0	48·0	36·0	70·6	53·2	17·4	60·0	51·7	·390	4·5	1·5	74	535	—	—	1·3	5	5	11	9	—	5·6	7	1·49

Meteorological Table, Quarter ending June 30th, 1874.

Names of Stations and Observers.	Height of Station above Sea Level	Months.	Month. Mean.	Month. Range.	Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Air.	Dew Point.	Elastic Force.	In a Cubic foot of Air. Mean.	In a Cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Satn. = 100	Mean Weight of a cubic foot of Air.	Thermometer. Maximum in Rays of Sun.	Thermometer. Minimum on Grass.	Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount Ozone.	Mean Amount Cloud.	Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
ALDERSHOT CAMP (Hants), John Arnold, Esq., M.S.C., F.M.S.	325	April	29·509	1·100	77·2	30·2	47·0	62·3	40·1	22·2	49·9	41·3	·262	3·0	1·1	73	537	104·5	34·8	1·6	6	4	7	13	2·0	6·1	13	2·46
		May	29·609	0·876	76·4	29·0	47·4	63·7	39·6	24·1	49·8	40·6	·254	2·9	1·2	71	538	120·0	36·1	1·4	14	6	3	8	1·5	6·7	10	0·82
		June	29·742	0·872	85·0	36·0	49·0	71·4	47·7	23·7	57·5	49·1	·348	3·8	1·4	73	532	125·3	45·2	1·5	8	8	7	7	1·2	6·8	10	2·43
ST. AUGUSTINE'S MONASTERY, (Ramsgate), Rev. E. J. Stutter, O.S.B.	108	April	29·788	1·080	71·0	33·0	38·0	58·4	42·5	15·9	49·7	42·9	·277	3·2	0·9	78	542	97·4	40·1	1·4	6	9	6	9	—	4·9	—	—
		May	29·862	0·857	78·5	36·4	42·1	61·1	43·1	18·0	51·0	42·8	·276	3·1	1·1	74	539	106·7	41·6	1·5	13	8	3	7	—	5·2	—	—
		June	30·013	0·861	79·0	43·0	36·0	68·2	51·4	16·8	58·5	50·9	·373	4·2	1·3	76	536	108·9	46·7	1·9	12	7	3	8	—	5·7	—	—
STRATHFIELD TURGISS (Hants), Rev. C. H. Griffith, M.A., F.M.S.	197	April	29·687	1·152	77·3	29·8	47·5	60·7	41·1	19·6	49·9	42·2	·269	3·0	1·0	76	539	111·9	36·4	0·7	8	4	5	13	4·5	5·0	12	1·90
		May	29·769	0·878	75·7	29·3	46·4	61·8	41·0	20·8	50·2	45·0	·277	3·2	0·9	77	541	152·2	37·1	0·5	14	10	0	7	4·5	6·4	9	0·83
		June	29·914	0·919	81·3	33·7	47·6	69·7	47·1	22·6	56·7	48·0	·335	3·8	1·2	73	536	119·0	43·9	0·6	7	11	4	8	4·0	5·7	6	0·91
WEYBRIDGE HEATH (Surrey), William F. Harrison, Esq., F.M.S.	150	April	29·744	1·135	81·3	28·5	52·8	62·6	40·6	22·0	50·3	43·3	·281	3·3	0·9	77	540	101·0	37·2	0·8	6	9	9	6	1·8	4·7	12	1·69
		May	29·850	0·826	75·0	28·8	46·2	62·7	39·8	22·9	50·1	43·7	·285	3·3	0·8	79	542	108·9	35·8	0·7	10	12	5	4	1·4	5·9	10	1·11
		June	29·985	0·930	83·5	35·0	48·5	70·3	47·8	22·5	57·6	49·4	·352	3·9	1·4	74	536	109·2	44·8	0·7	11	7	6	6	0·9	5·3	13	3·54
MARLBOROUGH COLLEGE (Wilts), Rev. Thomas A. Preston, M.A., F.M.S.	456	April	29·404	1·160	77·0	28·2	48·8	57·9	39·4	18·5	47·5	41·1	·259	3·0	0·8	80	537	117·3	38·5	—	9	6	7	8	—	6·8	13	1·87
		May	29·513	0·858	68·7	26·4	42·3	58·3	39·1	19·2	47·5	40·1	·248	2·8	0·9	76	539	132·1	37·6	—	10	12	3	6	—	7·7	11	0·67
		June	29·648	0·920	86·2	30·6	49·6	66·4	45·3	21·1	54·3	45·8	·307	3·5	1·3	72	534	142·6	44·3	—	4	11	4	11	—	7·0	8	1·22
ROYAL OBSERVATORY (Kent), The Astronomer Royal.	159	April	29·704	1·117	79·7	30·5	49·2	61·5	41·3	20·2	50·0	43·6	·284	3·3	0·8	79	539	109·9	34·5	0·5	4	7	6	13	—	5·8	12	1·35
		May	29·803	0·808	77·6	31·1	46·5	63·2	40·7	22·5	50·5	42·8	·275	3·2	1·0	76	541	123·5	32·4	0·2	12	8	4	7	—	6·8	7	0·42
		June	29·939	0·911	83·7	37·5	46·2	71·1	48·3	22·8	58·0	49·5	·355	3·9	1·5	74	535	132·7	41·1	0·2	8	9	7	6	—	6·4	11	2·42
STREATLEY VICARAGE (Berks), Rev. J. Slatter, M.A., F.R.A.S., F.M.S.	150	April	29·719	1·207	80·3	30·3	50·0	61·9	41·1	20·8	50·8	45·3	·303	3·6	0·8	82	539	71·7	—	1·6	7	7	6	10	—	5·6	13	1·49
		May	29·832	0·881	73·2	29·4	43·8	63·4	40·8	22·6	51·2	45·6	·305	3·5	0·8	81	540	75·6	—	1·3	12	7	4	8	—	6·3	9	1·23
		June	29·978	0·908	84·3	35·0	49·3	70·5	46·5	24·0	57·2	49·3	·351	3·9	1·3	75	537	81·0	—	1·6	10	7	4	9	—	5·8	7	1·06
ST. JOHN'S COLLEGE, BATTERSEA (London), Rev. J. P. Faunthorpe, M.A., F.R.G.S.	13	April	29·835	1·134	78·0	29·0	49·0	60·2	38·9	21·3	49·7	47·9	·332	3·9	0·3	94	542	78·4	31·6	1·8	2	5	13	10	—	4·8	7	1·09
		May	29·923	0·876	73·0	29·0	44·0	59·9	38·9	21·0	49·5	48·4	·341	3·9	0·2	96	544	85·7	34·8	1·5	7	9	8	7	—	5·9	3	0·69
		June	30·063	0·926	80·5	35·0	45·5	68·5	45·2	23·3	56·7	—	—	—	—	—	—	96·7	43·0	1·7	4	10	9	7	—	5·8	10	2·40
CAMDEN TOWN (London), G. J. Symons, Esq., F.M.S.	123	April	29·750	1·160	79·2	32·7	46·5	61·9	42·1	19·8	50·8	43·0	·278	3·2	1·0	75	540	97·0	38·8	—	8	5	5	12	—	5·2	11	1·26
		May	29·848	0·869	73·9	33·3	40·6	63·2	42·5	20·7	51·4	42·4	·272	3·1	1·2	72	541	111·4	39·3	—	16	2	3	10	—	5·9	7	1·14
		June	29·993	0·900	81·7	39·5	42·2	70·8	49·4	21·4	58·4	48·7	·340	3·9	1·0	81	540	121·4	46·8	—	12	4	8	6	—	5·7	12	2·06
CHISWICK, Thiselton Dyer, Esq.	25	April	29·811	1·130	79·7	28·5	51·2	61·6	40·6	21·0	50·2	40·3	·251	2·9	1·3	69	542	104·7	37·7	—	6	4	7	13	—	—	11	1·33
		May	29·948	0·876	75·0	27·0	48·0	63·1	39·0	24·1	49·8	40·1	·250	3·0	1·0	70	545	115·9	36·1	—	16	7	2	6	—	—	5	0·46
		June	30·078	0·914	81·7	33·7	48·0	70·3	46·8	23·5	57·0	48·0	·334	3·8	1·4	72	539	122·4	43·7	—	10	6	7	7	—	—	9	2·38
TOWN MUSEUM (Leicester), W. J. Harrison, Esq.	215	April	29·599	1·330	74·6	33·9	40·7	58·4	41·7	16·7	49·4	41·7	·265	3·0	1·0	75	539	114·8	36·2	0·8	5	6	10	9	—	5·5	13	1·39
		May	29·734	0·888	67·0	33·0	34·0	57·6	42·3	15·3	48·8	42·2	·268	3·1	0·9	78	542	116·5	36·2	0·8	13	10	3	5	—	8·2	15	1·75
		June	29·863	0·924	76·2	39·8	36·4	65·9	48·4	17·5	56·2	46·8	·324	3·6	1·5	71	536	120·7	40·8	0·9	8	7	6	9	—	6·3	7	0·53
OXFORD (Oxfordshire), Rev. R. Main, M.A., F.R.S., F.R.A.S.	210	April	29·647	1·186	75·6	31·5	44·1	60·2	41·7	18·5	50·8	42·8	·276	3·2	1·0	75	538	112·7	37·7	0·9	6	6	7	11	4·9	6·5	10	1·28
		May	29·768	0·880	72·4	30·6	41·8	60·3	42·7	17·6	51·1	42·7	·275	3·1	1·1	73	540	112·3	38·5	0·6	15	7	4	5	4·2	7·8	9	1·36
		June	29·887	0·924	80·7	37·6	43·1	68·6	48·1	20·5	58·1	48·4	·341	3·8	1·6	70	534	119·8	44·6	0·9	7	10	6	7	4·8	7·0	8	0·68
GLOUCESTER (Gloucester), E. Toller, Esq., M.D.	100	April	29·809	1·241	78·3	31·2	44·1	62·9	42·0	20·9	51·0	43·6	·285	3·2	1·0	76	542	110·5	58·3	0·6	7	6	7	10	2·0	4·6	14	1·47
		May	29·940	0·887	72·8	27·7	45·1	64·4	41·7	22·6	50·9	39·9	·247	2·8	1·4	69	543	106·1	38·9	0·4	11	11	2	7	1·4	5·6	6	0·35
		June	30·013	0·937	82·8	34·6	48·2	71·1	48·3	22·8	57·8	48·9	·346	3·9	1·5	72	527	112·3	45·1	0·4	8	8	7	7	2·8	5·3	6	1·50
ROYSTON (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	April	29·578	1·165	78·3	30·3	48·0	61·6	39·8	21·8	49·2	44·0	·289	3·3	0·7	83	538	—	—	—	5	6	9	10	—	6·0	11	1·37
		May	29·722	0·888	75·3	27·8	47·5	62·0	38·8	23·2	49·2	43·2	·280	3·2	0·8	80	541	—	—	—	18	4	2	7	—	7·3	9	1·01
		June	29·864	0·897	84·4	33·8	50·6	71·0	46·3	24·7	56·9	48·8	·345	3·9	1·3	74	535	—	—	—	12	5	5	8	—	6·6	10	1·26
CARDINGTON (near Bedford), Mr. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	105	April	29·765	1·190	78·4	30·0	48·4	61·3	40·3	21·0	50·3	43·9	·288	3·4	0·8	79	540	97·7	33·2	1·7	6	4	10	10	—	5·6	11	1·25
		May	29·878	0·890	75·0	29·0	46·3	61·3	40·3	21·0	50·0	43·2	·279	3·0	1·0	78	543	105·7	34·8	1·3	15	9	2	5	—	6·9	11	1·50
		June	30·009	0·906	82·0	37·0	45·0	70·2	47·0	23·2	57·8	49·3	·350	4·0	1·2	77	537	107·4	40·5	1·3	9	7	4	10	—	5·9	8	1·10
ST. DAVID'S COLLEGE, LAMPETER (Cardiganshire).	420	April	29·411	1·158	76·5	28·0	48·5	60·0	39·2	20·8	48·8	41·5	·263	2·9	0·9	76	536	104·1	—	—	9	4	9	9	—	—	12	2·11

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	April	29·818	1·198	71·9	29·9	42·0	58·1	40·5	17·6	48·0	43·8	·285	3·3	0·5	84	544	—	31·2	1·2	4	7	9	10	5·9	5·4	7	0·84
		May	29·904	0·848	73·2	31·6	41·6	58·9	40·7	18·2	48·5	43·0	·282	3·1	0·8	81	545	—	30·8	1·0	12	12	2	5	5·0	6·0	16	1·69
		June	30·052	0·884	77·7	36·2	41·5	67·0	46·9	18·1	55·6	50·1	·365	3·9	1·0	83	540	—	37·6	1·1	8	12	6	4	4·5	5·6	13	2·39
NORWICH (Norfolk), John Quinton, Esq., Jun.	42	April	29·821	1·182	74·5	30·5	44·0	57·8	40·2	17·6	48·0	44·8	·296	3·4	0·4	89	544	—	—	—	4	6	9	11	—	—	9	1·17
		May	29·921	0·866	73·0	32·0	41·0	58·1	40·3	17·8	48·1	45·8	·308	3·5	0·3	92	546	—	—	—	15	6	3	7	—	—	14	1·09
		June	30·057	0·904	81·5	38·5	42·0	67·0	48·0	19·0	56·0	51·2	·378	4·3	0·8	84	539	—	—	—	12	6	8	4	—	—	10	1·83
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	April	29·836	1·212	77·0	31·8	45·2	61·4	40·5	20·9	50·2	43·2	·280	3·1	1·0	78	542	108·1	36·3	0·5	7	6	6	11	3·8	5·1	12	1·14
		May	29·954	0·884	73·1	31·4	41·7	61·0	41·3	20·7	50·0	44·2	·291	3·3	0·8	81	544	113·6	36·6	0·4	14	6	3	8	3·0	7·3	13	1·53
		June	30·066	0·942	83·0	35·9	47·1	69·6	47·7	21·9	57·4	49·2	·353	4·0	1·2	74	538	120·4	43·6	0·5	10	5	7	8	3·5	6·6	9	1·63
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	April	29·703	1·360	81·0	35·3	45·7	61·0	41·7	19·3	51·0	45·9	·311	3·5	0·9	83	538	—	—	0·8	4	5	6	15	—	4·2	12	1·41
		May	29·886	0·880	65·8	36·6	29·2	59·1	43·7	15·4	50·6	42·8	·275	3·1	1·0	76	543	—	—	0·8	5	15	4	7	—	5·9	11	2·68
		June	30·015	0·940	72·0	41·2	30·8	66·6	49·1	17·5	56·8	47·6	·330	3·7	1·4	71	538	—	—	0·7	7	10	5	8	—	4·5	5	0·35
DERBY (Derbyshire), John Davis, Esq.	174	April	29·646	1·146	75·0	31·0	44·0	61·0	42·0	19·0	49·6	42·8	·273	3·1	0·9	78	539	—	—	—	2	7	9	12	—	—	11	1·26
		May	29·788	0·891	70·0	31·0	39·0	59·2	43·7	15·5	49·8	42·6	·274	3·2	0·8	76	541	—	—	—	10	12	3	6	—	—	12	1·33
		June	29·917	0·954	80·0	41·0	39·0	69·1	48·8	20·3	56·9	46·8	·320	3·6	1·4	69	536	—	—	—	7	5	5	13	—	—	—	1·07
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	183	April	29·634	1·206	73·0	30·6	47·4	61·2	40·6	20·5	49·4	42·4	·272	3·1	0·9	77	539	112·6	33·2	0·7	6	4	6	14	3·1	4·7	14	1·17
		May	29·768	0·834	72·1	33·1	39·0	59·5	42·3	17·2	49·0	42·8	·276	3·1	0·9	79	542	109·1	35·4	0·4	18	7	2	4	3·1	6·8	16	1·28
		June	29·901	0·934	84·2	40·2	42·0	69·2	47·5	21·7	56·5	42·2	·271	3·1	2·0	69	537	125·9	40·1	0·4	8	8	7	7	4·1	6·5	11	0·89
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	April	29·804	1·212	75·0	28·0	47·0	58·5	37·7	20·8	48·0	39·6	·243	2·8	1·0	75	544	117·0	35·0	1·4	10	5	9	6	—	5·2	8	1·18
		May	29·900	0·884	70·6	30·0	40·6	57·7	38·4	19·3	47·5	41·2	·270	3·0	0·7	80	546	130·2	36·3	1·6	14	6	4	7	—	6·6	16	1·08
		June	30·027	0·926	78·0	33·0	45·0	72·2	46·4	25·8	56·8	50·5	·367	4·1	1·0	79	538	130·1	42·2	1·5	12	4	7	7	—	6·1	9	1·35
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	April	29·617	1·310	72·2	34·1	38·1	56·8	43·4	13·4	49·0	40·7	·255	2·9	1·1	73	539	—	—	1·4	3	4	9	14	—	5·4	14	0·95
		May	29·778	0·842	63·1	37·9	25·2	56·1	44·4	11·7	49·0	41·1	·260	3·0	1·0	74	542	—	—	1·0	11	9	3	8	—	6·1	17	1·73
		June	29·904	0·959	69·4	44·2	25·2	64·5	50·3	14·2	56·0	46·6	·322	3·6	1·4	71	537	—	—	1·0	6	8	6	10	—	5·2	7	0·30
ECCLES (near Manchester), T. Mackereth, Esq., F.R.A.S., F.M.S.	145	April	29·678	1·428	77·5	31·3	46·2	60·1	40·4	19·7	49·2	42·1	·268	3·0	1·0	77	540	75·1	33·1	0·3	4	5	10	11	2·2	5·4	17	0·92
		May	29·840	0·854	67·9	28·3	39·6	58·5	40·8	17·7	48·8	41·7	·264	3·0	0·9	77	541	75·7	34·5	0·2	12	7	4	8	2·1	7·9	19	1·96
		June	29·957	0·966	74·7	35·1	39·6	68·2	46·0	22·2	55·1	47·8	·333	3·7	1·2	74	538	86·0	39·5	0·3	10	3	5	12	1·6	5·7	8	0·89
MOOR SIDE OBSERVATORY, HALIFAX (Yorkshire), Louis J. Crossley, Esq., F.M.S.	420	April	29·316	1·266	72·8	28·8	44·0	57·0	40·3	16·7	47·2	39·5	·243	2·8	0·9	76	536	89·5	34·4	—	5	6	4	15	3·0	6·5	17	2·15
		May	29·495	0·833	66·8	30·2	36·6	55·7	41·5	14·2	46·4	39·8	·246	2·8	0·8	79	540	85·1	38·1	—	9	15	2	5	2·0	8·6	18	1·26
		June	29·603	0·952	73·0	34·7	36·3	66·3	47·6	18·7	55·1	45·2	·302	3·4	1·5	70	532	102·2	41·2	—	6	6	4	14	1·6	6·5	7	0·86
BERMERSIDE OBSERVATORY, HALIFAX (Yorkshire), Edward Crossley, Esq., F.R.A.S.	520	April	29·259	1·264	71·5	29·0	45·5	58·0	38·5	19·5	46·9	39·0	·238	2·7	0·7	75	535	95·6	—	0·9	1	9	8	12	—	6·1	13	2·16
		May	29·428	0·822	67·0	29·5	37·5	56·4	39·5	16·9	46·1	39·9	·247	2·8	0·8	79	539	91·6	—	0·7	10	12	3	6	—	7·5	10	1·10
		June	29·530	0·966	74·0	35·0	39·0	66·9	41·5	22·4	54·5	45·6	·306	3·4	1·4	72	531	111·0	—	0·7	5	5	7	13	—	5·9	4	1·94
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	April	29·833	1·204	74·0	30·0	44·0	57·6	38·3	19·3	47·4	41·3	·260	3·0	0·7	81	545	85·2	36·0	—	—	—	—	—	—	—	8	1·11
		May	29·978	0·898	70·0	27·0	43·0	56·6	40·0	16·4	47·2	42·6	·273	3·2	0·6	85	548	86·0	33·0	—	—	—	—	—	—	—	18	1·73
		June	30·094	0·984	77·0	37·0	40·0	67·9	46·4	21·5	55·6	48·6	·344	3·8	1·1	78	510	97·5	43·6	—	—	—	—	—	—	—	10	0·60
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	363	April	29·444	1·502	72·0	31·7	40·3	57·8	39·9	17·9	47·6	42·1	·268	3·1	0·7	81	537	113·9	35·0	—	6	6	9	9	—	5·9	19	1·81
		May	29·596	0·881	68·0	31·4	36·6	58·2	41·6	16·6	48·1	43·3	·280	3·2	0·7	84	540	111·3	37·9	—	14	8	3	6	—	8·2	18	1·84
		June	29·615	0·990	72·0	34·3	37·7	66·1	45·0	21·1	54·2	48·3	·337	3·9	0·9	80	533	125·7	41·3	—	6	5	8	11	—	6·6	11	2·05
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	April	29·495	1·566	73·8	33·4	40·4	57·4	41·3	16·1	48·0	41·3	·260	3·0	0·9	77	538	82·8	—	0·8	5	4	6	15	—	4·4	15	1·75
		May	29·622	0·910	65·0	34·6	30·4	55·5	42·3	13·2	46·7	42·5	·273	3·2	0·5	85	542	77·9	—	1·0	15	7	1	8	—	7·3	13	0·79
		June	29·673	0·980	73·0	42·6	30·4	65·7	49·2	16·5	55·7	46·6	·319	3·6	1·3	71	533	95·4	—	1·0	7	3	4	16	—	5·7	10	0·81
LEEDS PHILOSOPHICAL HALL (Yorkshire), Louis C. Miall, Esq.	137	April	29·685	1·252	79·0	33·0	46·0	61·6	40·8	20·8	50·3	41·5	·262	3·0	1·1	72	539	70·9	—	1·2	7	5	5	13	—	6·5	14	1·33
		May	29·832	0·840	72·0	34·0	38·0	60·5	42·0	18·3	49·2	42·6	·274	3·1	0·9	78	543	68·7	—	1·1	13	13	1	4	—	7·4	18	0·95
		June	29·947	0·988	79·0	41·0	38·0	70·2	48·6	21·6	58·0	48·2	·337	3·7	1·7	70	535	78·3	—	1·3	8	7	3	12	—	7·0	9	0·47
COCKERMOUTH (Cumberland), H. Dodgson, Esq., M.D., F.R.A.S., F.M.S.	146	April	29·618	1·626	76·2	29·1	47·1	57·1	41·9	15·2	48·7	42·1	·268	3·1	0·6	79	540	100·8	24·4	0·6	8	5	10	12	2·2	5·3	13	1·51
		May	29·819	0·824	64·9	31·2	33·7	57·9	41·7	16·2	49·1	41·7	·263	3·0	1·0	75	543	103·3	25·5	0·5	10	12	4	5	2·1	5·9	12	1·29
		June	29·935	0·978	73·9	31·1	41·9	66·2	47·5	18·7	53·6	48·6	·344	3·8	1·1	78	537	115·4	40·5	0·3	7	4	4	15	1·4	4·5	9	1·29

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Of all Lowest.	Daily Range.	Mean Temperature. Air.	Dew Point.	Vapour. Elastic Force.	In a cubic foot of Air. Mean.	Short of Saturation.	Mean Degree of Humidity. Sat. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Minimum on Grass.	Wind. Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Amount collected.
	feet.		in.	in	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
ALLENHEADS (Northumberland), Mr. T. Kidd, Assistant to W. B. Beaumont, Esq., M.P.	1360	April	28·315	1·200	69·0	30·0	39·0	53·3	36·5	16·8	43·0	37·5	·225	2·6	0·6	81	522	101·0	33·8	1·5	–	–	–	–	–	5·4	13	2·75
		May	28·528	0·712	64·0	29·0	35·0	52·6	37·4	15·2	42·5	38·1	·232	2·6	0·5	85	526	106·6	35·2	1·0	–	–	–	–	–	8·0	16	2·32
		June	28·619	0·888	71·5	31·0	40·5	63·0	43·4	19·6	51·0	46·3	·316	3·5	0·8	84	529	120·0	39·7	1·2	–	–	–	–	–	6·3	12	1·55
SILLOTH RECTORY (Cumberland), Rev. Francis Redford, M.A., F.R.A.S., F.M.S.	28	April	29·714	1·605	75·2	33·5	41·7	59·1	41·4	17·7	49·4	41·3	·261	3·0	1·0	74	541	91·6	37·9	1·5	2	4	7	17	9·2	4·7	11	1·26
		May	29·945	0·854	69·2	31·8	37·4	60·8	42·0	18·8	49·8	41·3	·261	3·0	1·1	74	545	95·4	38·4	1·3	5	15	1	10	9·5	5·7	11	1·04
		June	30·059	0·999	76·5	34·0	42·5	70·0	46·5	23·5	56·7	47·5	·328	3·7	0·9	71	539	106·7	42·8	1·1	5	5	6	14	6·9	4·2	6	0·71
CARLISLE (Cumberland), J. Cartmell, Esq., F.M.S.	114	April	29·672	1·392	75·4	29·7	45·7	57·8	39·0	18·8	47·6	40·2	·249	3·0	1·0	76	542	90·6	34·2	2·0	3	5	6	16	6·5	5·8	9	1·13
		May	29·874	0·836	68·6	27·5	41·1	57·8	39·5	18·3	47·8	39·2	·240	2·8	0·9	73	545	91·8	35·1	2·1	12	9	4	6	5·4	6·9	14	1·38
		June	29·973	1·023	74·7	29·4	45·3	67·2	44·7	22·5	55·4	44·9	·299	3·4	1·6	68	539	105·0	39·7	1·7	2	7	3	8	5·3	4·8	8	1·11
BYWELL (Northumberland), Mr. John Dawson, Assistant to W. B. Beaumont, Esq., M.P.	87	April	29·655	1·486	75·0	34·0	41·0	59·9	42·3	17·6	49·1	38·5	·234	2·7	1·3	66	540	83·2	35·8	1·4	5	7	5	13	–	4·0	14	1·61
		May	29·871	0·830	66·0	35·0	31·0	55·6	43·3	12·3	47·9	40·4	·250	3·0	0·7	76	545	72·2	36·8	1·2	5	17	2	7	–	5·8	20	2·85
		June	29·958	0·968	74·0	39·0	35·0	66·5	49·7	16·8	56·1	46·2	·316	3·5	1·5	69	538	96·3	43·0	1·3	7	6	3	14	–	4·0	13	1·01
NORTH SHIELDS (Northumberland), Robert Spence, Esq.	124	April	29·704	1·615	71·5	33·4	38·1	54·2	40·7	13·5	46·3	38·2	·234	2·7	0·9	74	544	–	38·9	1·6	6	5	5	14	–	4·8	10	0·72
		May	29·898	0·839	65·5	31·8	33·7	52·2	41·5	10·7	45·8	39·8	·246	2·8	0·7	80	548	–	40·7	1·4	9	13	5	4	–	6·8	17	2·30
		June	29·995	1·019	72·0	37·0	35·0	62·8	47·6	15·2	53·8	45·1	·300	3·4	1·0	72	541	–	46·9	1·7	8	5	5	12	–	5·4	8	1·00
MILTOWN (Banbridge, Ireland), John Smyth, Esq., Jun., M.A., M.I.C.E.I.	200	April	29·441	1·311	70·0	30·0	40·0	56·6	40·3	16·3	48·2	39·8	·245	2·9	0·9	73	537	102·2	34·4	2·2	3	3	15	9	–	4·1	14	1·68
		May	29·661	0·726	68·0	31·0	37·0	57·0	41·9	15·1	48·8	40·3	·250	2·8	1·0	72	541	100·8	37·0	1·8	10	8	9	4	–	3·0	11	0·68
		June	29·755	0·940	75·0	35·0	40·0	66·8	45·4	21·4	55·6	44·9	·300	3·4	1·6	68	534	121·3	38·5	1·7	10	4	8	8	–	4·5	11	1·12

Note.—*The Barometer Reading*, Bradford, 2nd April, 3h. p.m., 29·832 in., has been altered to 29·332 in.
The Wet Bulb Thermometer, Chiswick, 28th May, 3h. p.m., 29°2, has been altered to 59°2.
St. John's College, Battersea, June, all Wet Bulb Thermometer readings are wrong. Muslin probably in a bad state from deposition of lime salts from hard water.

Second Rain-gauges are placed—

			April.		May.		June.		Total during the Quarter.
At Portsmouth,	at the height of	20 feet *above the ground*, the amount collected was	2·52 inches.	–	1·15 inches.	–	1·81 inches.	–	5·48 inches.
,, Strathfield Turgiss,	,,	38 feet ,, ,,	1·42 ,,	–	0·64 ,,	–	0·74 ,,	–	2·80 ,,
,, Eccles (Manchester),	,,	34 feet ,, ,,	0·67 ,,	–	1·85 ,,	–	0·70 ,,	–	3·22 ,,
,, Carlisle,	,,	3 feet ,, ,,	3·27 ,,	–	3·18 ,,	–	4·50 ,,	–	10·95 ,,
,, Miltown (Ireland),	,,	40 feet ,, ,,	1·39 ,,	–	1·39 ,,	–	0·96 ,,	–	3·74 ,,
,, Oxford,	,,	22 feet ,, ,,	1·16 ,,	–	1·52 ,,	–	0·67 ,,	–	3·35 ,,
,, Marlborough College,	,,	8 inches ,, ,,	1·82 ,,	–	0·65 ,,	–	1·18 ,,	–	3·65 ,,
,, ,,	,,	1 foot ,, ,,	1·75 ,,	–	0·63 ,,	–	1·17 ,,	–	3·55 ,,
,, Cardington,	,,	36 feet ,, ,,	1·00 ,,	–	1·00 ,,	–	0·75 ,,	–	2·75 ,,
,, Nottingham,	,,	39 feet ,, ,,	1·17 ,,	–	1·24 ,,	–	0·84 ,,	–	3·25 ,,
,, Wisbech,	,,	8 feet ,, ,,	1·09 ,,	–	1·51 ,,	–	1·61 ,,	–	4·21 ,,
,, Aldershot Camp,	,,	25 feet ,, ,,	1·86 ,,	–	6·63 ,,	–	1·93 ,,	–	4·42 ,,

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days on which it fell.	Rain. Amount collected.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
Guernsey	29·669	70·0	39·0	31·0	59·0	48·4	26·3	10·7	51·8	47·6	·330	3·8	0·6	86	539	—	—	1·2	11	6	5	9	3·9	3·9	28	[illegible]
Helston	—	76·0	34·0	42·0	64·3	49·3	35·3	15·0	55·2	46·2	·315	3·7	1·5	72	535	92·9	42·9	2·1	9	6	6	10	4·4	3·6	31	[illegible]
Truro	29·713	75·0	30·0	45·0	62·3	46·0	37·3	16·3	53·1	44·9	·301	3·4	1·2	74	541	—	—	2·5	9	8	5	8	—	5·9	22	[illegible]
Sidmouth	29·688	75·8	32·9	42·9	60·5	45·6	34·0	14·9	51·9	47·0	·322	3·6	0·9	84	542	—	—	1·4	6	6	11	8	—	2·8	26	[illegible]
Osborne	29·647	86·5	34·2	52·3	64·9	45·5	41·2	19·4	53·6	49·1	·353	4·0	0·7	85	537	105·4	41·2	0·4	7	9	5	8	—	5·4	25	[illegible]
Portsmouth	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	114·5	42·1	1·7	6	9	6	9	5·1	5·5	32	[illegible]
Worthing	29·690	75·4	34·4	42·0	62·0	46·2	34·3	15·8	53·2	44·6	·300	3·4	1·2	73	541	113·2	42·3	0·7	8	9	5	9	2·2	5·2	26	[illegible]
Brighton	29·703	75·3	34·0	41·3	61·0	45·9	35·1	15·1	52·6	43·5	·286	3·2	1·2	69	538	110·6	45·5	0·8	9	7	5	10	—	5·6	25	[illegible]
Hastings	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1·4	—	—	—	—	—	5·4	—	[illegible]
Taunton	29·639	83·7	29·5	54·2	65·3	43·5	48·9	21·8	53·2	45·6	·308	3·5	1·1	76	540	77·7	45·5	0·3	7	8	6	9	—	6·1	30	[illegible]
Salisbury	29·680	85·0	26·0	59·0	67·4	40·2	52·3	27·2	42·7	46·4	·317	3·6	0·9	79	538	114·9	37·0	1·4	6	10	8	6	—	5·7	32	[illegible]
Barnstaple	29·658	79·0	34·0	45·0	65·0	48·8	39·0	16·2	55·5	47·7	·334	3·8	1·3	75	538	—	—	1·1	7	5	8	10	—	3·3	27	[illegible]
Aldershot Camp	29·686	85·0	29·0	56·0	65·8	42·5	47·8	23·3	42·4	43·7	·288	3·2	1·2	72	536	116·6	38·7	1·5	9	6	6	9	1·6	6·3	33	[illegible]
Ramsgate	29·699	79·0	33·0	46·0	62·6	45·7	38·7	16·9	53·1	45·5	·309	3·5	1·1	76	539	104·3	42·8	1·6	10	8	4	8	—	5·3	—	[illegible]
Strathfield Turgiss	29·710	81·3	29·3	52·0	64·1	43·1	47·2	21·0	52·3	44·4	·294	3·3	1·0	75	539	127·7	39·1	0·6	10	8	3	9	4·3	5·7	27	[illegible]
Weybridge Heath	29·720	83·5	28·5	55·0	65·2	42·7	49·2	22·5	52·7	45·5	·306	3·5	0·8	77	539	104·7	39·3	0·7	9	9	7	5	1·4	5·5	35	[illegible]
Marlborough College	29·744	80·2	26·4	53·8	60·9	41·3	46·9	19·6	49·8	42·3	·271	3·1	1·0	76	537	130·7	40·1	—	8	10	5	8	—	7·2	32	[illegible]
Royal Observatory	29·685	83·7	30·5	53·2	65·3	43·4	47·3	21·9	52·8	45·3	·305	3·5	1·1	76	538	122·0	35·0	0·3	8	8	6	9	—	6·3	30	[illegible]
Streatley Vicarage	29·690	84·3	29·4	54·9	65·3	42·8	47·7	22·5	53·1	46·7	·320	3·7	1·0	79	539	76·1	—	1·5	10	7	5	9	—	5·9	29	[illegible]
Battersea (London)		80·5	29·0	51·5	62·9	41·0	46·2	21·9	52·0	—	—	—	—	—	—	86·9	31·5	1·7	4	8	10	8	—	5·2	30	[illegible]
Camden Town (Lndn.)	29·701	81·7	32·7	49·0	65·3	44·7	43·1	20·6	53·5	44·7	·297	3·4	1·0	76	540	109·9	41·6	—	12	4	5	9	—	5·6	30	[illegible]
Chiswick	29·686	81·7	27·0	54·7	65·0	42·1	49·1	22·9	52·3	42·8	·278	3·2	1·2	70	542	114·3	37·2	—	11	6	5	9	—	—	25	[illegible]
Leicester	29·719	76·2	43·2	33·0	60·6	41·1	37·0	16·5	51·5	43·6	·286	3·2	1·1	75	539	117·3	37·7	0·8	9	8	6	8	—	6·1	33	[illegible]
Oxford	29·700	80·7	30·6	50·1	63·0	44·2	43·0	18·9	53·3	44·6	·297	3·4	1·2	73	537	114·9	40·3	0·8	9	8	6	8	4·6	7·1	27	[illegible]
Gloucester	29·753	82·8	27·7	55·1	64·1	44·0	45·8	22·1	53·2	44·1	·293	3·3	1·3	72	541	109·6	40·8	0·5	9	8	5	8	2·1	5·1	26	[illegible]
Royston	29·704	84·4	27·8	56·6	64·9	41·6	48·7	23·2	51·8	45·3	·305	3·5	0·9	79	538	—	—	—	12	5	5	8	—	6·6	28	[illegible]
Cardington	29·688	82·0	29·0	53·0	64·3	42·5	46·5	21·7	52·7	45·5	·306	3·5	1·0	78	540	103·6	36·2	1·1	10	7	5	8	—	6·1	30	[illegible]
Somerleyton Rectory	29·670	77·7	29·9	47·8	61·3	42·7	41·7	18·0	50·7	45·6	·311	3·4	0·8	83	543	—	34·2	1·1	8	10	6	6	5·1	5·7	34	[illegible]
Norwich	29·650	80·5	30·5	50·0	61·0	42·8	42·3	18·2	50·7	47·3	·327	3·7	0·5	88	543	—	—	—	10	6	7	7	—	—	33	[illegible]
Wisbech	29·665	83·0	31·4	51·6	64·0	44·2	41·7	20·8	52·5	45·5	·308	3·5	1·0	78	541	114·0	38·9	0·5	10	6	5	9	3·4	6·5	34	[illegible]
Llandudno	29·673	81·0	45·3	45·7	62·2	44·8	35·2	17·4	52·8	45·4	·305	3·4	1·1	77	540	—	—	0·8	5	10	5	10	—	4·9	28	[illegible]
Derby	29·684	80·0	31·0	49·0	63·1	44·8	40·7	18·3	52·1	44·1	·290	3·3	0·8	74	539	—	—	—	6	8	6	10	—	—	—	[illegible]
Nottingham	29·635	82·2	30·6	51·6	63·3	43·5	42·8	19·8	51·6	42·5	·273	3·1	1·3	75	539	115·9	36·2	0·5	11	6	5	8	3·4	6·0	41	[illegible]
Holkham	29·650	78·0	28·0	50·0	62·8	40·8	45·9	22·0	50·8	43·8	·293	3·3	0·9	77	533	—	—	1·5	12	5	7	7	—	6·0	35	[illegible]
Liverpool	29·701	72·2	34·1	38·1	59·1	45·0	29·5	13·1	51·3	42·8	·279	3·2	1·2	73	539	—	—	1·0	7	7	6	11	—	5·6	38	[illegible]
Eccles	29·694	77·5	28·3	49·2	62·3	42·4	41·8	19·9	51·4	43·9	·288	3·2	1·0	76	541	78·9	35·7	0·3	9	5	6	10	2·0	6·[illegible]	44	[illegible]
Moorside, Halifax	29·672	73·0	28·8	44·2	59·7	43·1	39·0	16·6	49·6	41·5	·261	3·0	1·1	75	536	92·3	37·9	—	7	9	3	11	2·2	7·2	42	[illegible]
Bermerside, Halifax	29·700	74·5	29·0	45·5	60·4	40·8	40·7	19·6	49·2	41·5	·264	3·0	1·0	75	532	99·4	—	0·8	5	9	6	10	—	6·5	27	[illegible]
Hull	29·690	77·0	27·0	50·0	60·7	41·6	42·3	19·1	50·1	44·2	·292	3·3	0·8	81	544	99·6	29·2	—	—	—	—	—	—	—	36	[illegible]
Stonyhurst	29·670	72·0	31·4	40·6	60·7	42·2	38·2	18·5	50·0	41·6	·295	3·4	0·8	82	537	117·0	38·1	—	9	6	7	9	—	6·9	48	[illegible]
Bradford	29·707	73·8	33·4	40·4	59·5	41·3	33·7	15·3	50·1	43·5	·284	3·3	0·9	78	538	85·4	—	0·9	9	5	4	13	—	5·8	38	[illegible]
Leeds	29·680	79·0	33·0	46·0	64·0	43·8	40·7	20·2	52·5	44·1	·291	3·3	1·2	73	539	72·6	—	1·2	9	8	3	10	—	7·0	41	[illegible]
Cockermouth	29·656	76·2	31·2	45·0	59·4	43·7	39·7	16·7	51·1	44·1	·292	3·3	1·0	77	540	105·5	36·8	0·5	7	7	6	11	1·9	5·2	34	[illegible]
Allenheads	29·639	71·5	29·0	42·5	56·3	39·1	38·2	17·2	45·5	40·6	·258	2·9	0·6	83	526	109·2	36·2	1·2	—	—	—	—	—	6·6	41	6·62
Silloth	29·654	76·5	31·8	44·7	63·3	43·3	40·5	20·0	52·0	43·4	·281	3·2	1·0	73	542	97·9	39·7	1·3	4	8	5	14	8·5	4·9	28	[illegible]
Carlisle	29·702	75·4	27·5	47·9	60·9	41·1	44·0	19·8	50·3	41·4	·263	3·1	1·2	72	542	95·8	36·3	1·9	6	7	4	10	5·7	5·8	31	[illegible]
Bywell	29·654	75·0	34·0	41·0	60·7	45·1	35·7	15·6	51·0	41·7	·267	3·1	1·2	70	541	83·9	38·5	1·3	6	10	3	11	—	4·6	47	[illegible]
North Shields	—	72·0	31·8	40·2	56·4	43·3	35·6	13·1	48·6	41·0	·260	3·0	0·9	75	544	—	42·2	1·6	8	8	5	10	—	5·7	35	[illegible]
Miltown (Ireland)	29·670	75·0	30·0	45·0	60·1	42·5	39·0	17·6	50·9	41·7	·265	3·0	1·2	71	537	108·4	36·6	1·9	8	5	11	7	—	4·5	36	[illegible]

The highest temperatures of the air were at Osborne, 86°·5; and both at Aldershot and Streatley, 85°·0.

The lowest temperatures of the air were at Salisbury, 26°·0; Marlborough, 26°·4; and at Chiswick, 27°·0.

The greatest daily ranges of the temperatures of the air were at Salisbury, 27°·2; Aldershot, 23°·3; and at Royston, 23°·2.

The least daily ranges of the temperatures of the air were at Guernsey, 10°·7; North Shields, 13°·1; and Liverpool, 13°·1.

The greatest numbers of rainy days were at Bywell, 47; and Eccles, 41.

The least numbers of rainy days were 26 both at Gloucester and Worthing; and at Barnstaple, 27.

The heaviest falls of rain were at Allenheads, 6·62 inches; Weybridge, 6·24 inches; and at Portsmouth, 5·76 inches.

The least falls of rain were at Leeds, 2·75 inches; and at Silloth, 3·01 inches.

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Mean Number of Days it fell.	Rain. Mean Amount collected.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									
Guernsey	29·669	70·0	39·0	31·0	59·0	48·4	26·3	10·7	51·8	47·6	·330	3·8	0·6	86	539	—	—	1·2	11	6	5	9	3·9	3·9	28	[illegible]
Between the latitudes 50° and 51°	29·684	77·9	33·1	44·8	62·8	46·5	36·4	16·3	53·4	46·4	·318	3·6	1·1	78	539	106·5	42·1	1·5	8	8	6	9	3·9	4·8	31	[illegible]
51° and 52°	29·701	82·1	29·5	52·6	64·6	43·3	46·1	21·3	51·5	44·9	·301	3·4	1·1	75	539	107·9	39·8	1·0	9	8	6	8	2·8	5·7	29	[illegible]
52° and 53°	29·679	81·4	30·7	50·7	63·0	43·2	42·8	19·7	51·9	45·2	·303	3·4	0·9	79	540	111·2	36·1	0·8	9	7	6	8	4·0	5·9	33	[illegible]
53° and 54°	29·688	75·3	30·1	45·1	61·0	42·5	39·6	18·4	50·4	43·9	·283	3·2	1·0	77	538	92·2	37·7	0·8	8	7	5	10	2·1	6·6	39	[illegible]
54° and 55°	29·665	74·9	30·7	44·2	60·3	42·4	39·6	17·9	50·0	42·2	·273	3·1	1·0	75	538	98·7	37·5	1·2	6	8	5	11	5·4	5·4	36	[illegible]
North Shields	—	72·0	31·8	40·2	56·4	43·3	35·6	13·1	48·6	41·0	·260	3·0	0·9	75	544	—	42·2	1·6	8	8	5	10	—	5·7	35	[illegible]
Miltown, Banbridge (Ireland)	29·670	75·0	30·0	45·0	60·1	42·5	39·0	17·6	50·9	41·7	·265	3·0	1·2	71	537	108·4	36·6	1·9	8	5	11	7	—	4·5	36	[illegible]
Mean for the Quarter, 50° to 55° Year 1871	29·614	77·9	28·5	49·4	61·1	43·6	39·1	17·5	50·8	44·4	·294	3·3	0·9	79	540	—	38·0	0·7	8	8	5	9	—	6·0	41	[illegible]
" 1872	29·591	82·5	29·6	52·7	61·1	43·8	39·8	17·3	51·1	44·8	·298	3·5	0·9	80	539	104·4	38·4	1·2	6	4	7	13	4·2	6·1	48	[illegible]
" 1873	29·693	76·8	28·8	48·0	61·0	43·7	37·7	17·3	51·2	44·3	·297	3·4	0·9	78	541	100·7	37·6	1·2	9	6	6	10	3·8	6·0	36	[illegible]
" 1874	29·683	78·3	30·8	47·5	62·3	43·6	40·9	18·7	51·4	44·5	·296	3·3	1·0	77	539	103·3	38·6	1·1	8	8	6	9	3·6	5·7	34	[illegible]

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING SEPTEMBER 30, 1874.

REMARKS ON THE WEATHER DURING THE QUARTER ENDING SEPTEMBER 30TH, 1874.

By JAMES GLAISHER, ESQ., F.R.S., *&c.*

The cold weather which prevailed during the last three weeks of June, was succeeded at the beginning of July by weather which was generally warm, but frequently cold; the average daily excess over the average daily temperature till the 2nd August was 2½°. A period of moderately cold weather followed, and the daily temperatures were, with the exceptions of a few warm days, below their averages till the 19th day of September, the average daily deficiency for the 48 days ending 19th September was 1°; from the 20th of September the weather was warm till the end of the quarter, the average daily excess being as large as 5°. The mean temperature of July was 6°·4 higher than in June; that of August was 4°·1 lower than in July; and that of September was 2°·4 below that of August. (From the preceding 33 years' observations the mean temperature of July is higher than that of June by 3°·2; that of August is 0°·8 lower than July; and September 4°·2 lower than in August.)

The mean temperature of July above that of June over the whole country was 6°0; that of August below that of July was 3°·8; and that of September below August was 2°·2. the mean temperature of July over that of June was largest in the Midland Counties, and was smallest both at extreme Northern and Southern stations. The decrease from July to August and from August to September were nearly the same at all places.

The readings of the barometer at 159 feet above the level of the sea were variable, but generally above their averages from the 1st to the 19th of July; the highest reading in the month being 30·1 ins. on the 6th. From the 20th to the 29th the readings were below their averages, the minimum reading for the month (29·5 ins.) occurring on the 28th. On the 30th and 31st the values were again in excess, but only to a small amount.

In August the barometer readings were generally below their averages from the 1st to the 14th, above from the 15th to the 26th, and again below from the 27th to the end of the month. The highest reading in the month was 30·3 ins. on the 21st, and the lowest 29·3 ins. on the 14th.

From the 1st to the 12th of September the barometer readings were all below their averages, the lowest reading in the month being 29·3 ins. on the 9th. From the 13th to the 30th the readings were alternately above and below their averages for short periods. The highest reading in the month was 30·2 ins. on the 14th.

At Greenwich the mean decrease of atmospheric pressure from June to July was 0·113 in., that from July to August 0·043 in., and that from August to September 0·031 in.

The mean decrease from all stations from June to July was 0·125 in.; from July to August was 0·060 in.; and from August to September was 0·046 in. The decrease from month to month was nearly the same at all stations.

The mean temperature of the air for July was 64°·4, being respectively 2°·8 and 2°·2 higher than the averages of 103 years, and the preceding 33 years; it was 1°·0 higher than that of 1873 and 0°·6 lower than that of 1872.

The mean temperature of August was 60°·3, being 0°·5 lower than the average of 103 years, and 1°·1 lower than that of the preceding 33 years, it was respectively 2°·4 and 0°·7 lower than the corresponding values in 1873 and 1872.

The mean temperature of September was 57°·9, being respectively 1°·4 and 0°·7 higher than the averages of 103 years, and the preceding 33 years; and 3°·2 and 0°·5 respectively higher than those recorded in the month of September in the years 1873 and 1872.

The mean high day temperatures of the air were 4°·7 and 0°·7 higher than their respective averages in July and September, and 0°·9 lower in August.

The mean low night temperatures were respectively 0°·4 and 1°·2 higher than their averages in July and September, and 1°·6 lower in August.

The mean daily ranges of temperature were greater than their respective averages in July and August by 4°·3 and 0°·8, but that for September was lower by 0°·4.

Therefore the days and nights of July and September were warm, particularly the nights in September are thus distinguished; the lowest reading of a thermometer at night in this month was 43°·4; usually the temperature at night in September declines several times below 40°, and at times to 32°; in the year 1868 the lowest reading was nearly the same, and there is no other instance back for many years.

The fall of rain in July was 2·6 ins., being 0·1 in. above the average; in August it was 1·4 ins., being 1·0 in. below the average, and in September it was 2·2 ins., being 0·2 in. below the average.

The fall of rain, therefore, continues remarkably deficient:

				Ins.		Ins.	
In the 7	months	ending July -	it was	9·17,	being	4·18	less than the average.
8	„	„ -	„	9·47	„	5·85	„
8	„	August -	„	10·61	„	5·13	„
9	„	„	„	10·91	„	6·80	„
9	„	September	„	12·83	„	5·37	„
10	„	„	„	13·13	„	7·04	„

Back to the year 1815:—There are only three instances of a fall of rain in the 7 months ending July being less than 9·2 ins., viz., in 1847, when it was 8·2 ins.; in 1864, when it was 8·2 ins.; and in 1870, when it was 7·3 ins.

There are two instances of less fall than 9·5 ins. in the 8 months ending July, viz., in 1847, *when it was 9·3 ins.;* and in 1864, when it was also 9·3 ins.

E. & S.—550.—11/74.

There are four instances of less falls than 10·6 ins. in the 8 months ending August, viz., in 1840, 10·4 ins.; in 1847, 10·2 ins.; in 1864, 9·6 ins.; and in 1870, 9·3 ins.

There is only one instance of a smaller fall than 10·9 ins. in the 9 months ending August, viz., in 1864, when the fall was 10·7 ins.

There are three instances of smaller falls than 12·8 ins. in the 9 months ending September, viz., in 1847, 11·8 ins.; in 1864, 12·4 ins.; and in 1870, 10·9 ins.

There is only one instance of a smaller fall than 13·1 ins. in the 10 months ending September, viz., in 1847, when it was 12·9 ins.

The average duration of the different directions of the wind referred to eight points of the compass, and the duration of each direction in each month in the quarter, were as follows:—

Direction of Wind.	July. Average.	July. 1874.	July. Departure from Average.	August. Average.	August. 1874.	August. Departure from Average.	September. Average.	September. 1874.	September. Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	2½	1	−1½	2	1	−1	1½	1	− ½
N.	3½	1	−2½	3	1	−2	3½	1	−2½
N.E.	3¾	2	−1¾	3	2	−1	5¼	1	−4¼
E.	1	3	+2	1	2	+1	2	1	−1
S.E.	½	3	+2½	1¼	2	+ ¾	1½	2	+ ½
S.	2¾	2	− ¾	3	1	−2	2	5	+3
S.W.	10½	9	−1½	10½	13	+2½	7¼	13	+5¾
W.	4	9	+5	3½	9	+5½	2½	6	+3½
Calm, nearly.	2½	1	−1½	3½	0	−3½	4½	0	−4½

The + signs denote excesses over averages; in the months of July and August the largest numbers affected with this sign is the W. wind, and in September the S.W. wind.

The − signs denote defects below averages; in July the largest number with this sign is the N. wind; in August is both the N. and S. winds; and in September the N.E. wind.

Thus the prevailing winds throughout the quarter have been W. and S.W.

1874. Months.	Temperature of Air. Mean.	Air. Diff. from average of 103 years.	Air. Diff. from average of 33 years.	Evaporation. Mean.	Evaporation. Diff. from average of 33 years.	Dew Point. Mean.	Dew Point. Diff. from average of 33 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 33 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 33 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour. Diff. from average of 33 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
July -	64·4	+2·8	+2·2	59·0	+1·3	54·6	+0·7	25·4	+4·3	67·0	0·427	+0·010	4·7	+0·1
August	60·3	−0·5	−1·1	56·6	−0·7	53·3	−0·5	20·6	+0·8	64·0	0·407	−0·009	4·5	−0·1
Sept. -	57·9	+1·4	+0·7	55·4	+1·4	53·1	+2·1	18·1	−0·4	60·5	0·404	+0·025	4·5	+0·3
Means -	60·9	+1·2	+0·6	57·0	+0·7	53·7	+0·8	21·4	+1·6	63·8	0·413	+0·009	4·6	+0·1

1874. Months.	Degree of Humidity. Mean.	Humidity. Diff. from average of 33 years.	Reading of Barometer. Mean.	Barometer. Diff. from average of 33 years.	Weight of a Cubic Foot of Air. Mean.	Weight. Diff. from average of 33 years.	Rain. Amount.	Rain. Diff. from average of 59 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
July -	70	−5	29·826	+0·025	526	−2	2·6	+0·1	220	0	4	27	37·0	58·0
August	78	+2	29·783	−0·010	530	+1	1·4	−1·0	301	0	5	26	33·9	54·6
Sept. -	84	+4	29·752	−0·055	531	−2	2·2	−0·2	259	0	8	22	34·7	54·0
Means -	77	0	29·787	−0·013	529	−1	Sum 6·2	Sum −1·1	Mean 260	Sum 0	Sum 17	Sum 75	Lowest 33·9	Highest 58·0

Note.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the plus sign (+) signifies above the average.

Thunderstorms occurred, on the 9th of July at Guernsey, Osborne, Portsmouth, Brighton, Strathfield Turgiss, and Hastings; on the 10th at Strathfield Turgiss, Streatley, Royston, and Cardington; on the 11th at Weybridge Heath and Streatley; on the 19th at Carlisle; on the 20th at Norwich, Calcethorpe, Hull, Cockermouth, Allenheads, Silloth, and Bywell; on the 21st at Oxford, Leicester, Cardington, Norwich, Wisbech, Halifax, Calcethorpe, Bradford, Leeds, Cockermouth, Carlisle, and Bywell; on the 22nd at Eccles, Stonyhurst, Silloth, and Carlisle; on the 23rd at Leicester, Royston, Cardington, Norwich, Wisbech, Calcethorpe, Bradford, Allenheads, Bywell, and North Shields; on the 24th at Brighton, Taunton, Salisbury, Streatley, Gloucester, Royston, Cardington, Somerleyton, Norwich, Llandudno, and Hull; on the 25th at Norwich; on the 28th at Norwich, Hawarden, Halifax, Hull, Bradford, and Leeds; on the 29th at Osborne, Portsmouth, Hastings, Streatley, Cardington, Somerleyton, Wisbech, Calcethorpe, and North Shields. On the 3rd of August at Hull; on the 7th at Miltown; on the 8th at Wisbech and Eccles; on the 9th at Portsmouth and

Eccles; on the 10th at Salisbury, Cardington, Somerleyton, Calcethorpe, Eccles, North Shields, and Miltown; on the 13th at Eccles, Stonyhurst, Cockermouth, Allenheads, Silloth, Carlisle, and North Shields; on the 25th at Royston and Cardington; on the 28th at Stonyhurst; and on the 29th at Heston, Truro, Salisbury, Royston, Cardington, Somerleyton, Wisbech, Hull, Cockermouth, and Carlisle. On the 2nd of September at Llandudno, Eccles, Halifax, Hull, Stonyhurst, Leeds, and North Shields; on the 3rd at Truro, Osborne, and Carlisle; on the 9th at Truro, Osborne, Bournemouth, Weybridge Heath, Cardington, Wisbech, Eccles, Stonyhurst, and Silloth; on the 10th at Hull and Stonyhurst; on the 21st at Allenheads and Carlisle; on the 23rd and 27th at Calcethorpe; on the 29th at Silloth; and on the 30th at Guernsey, Portsmouth, Barnstaple, and Calcethorpe.

Thunder was heard, but lightning was not seen, on the 2nd of July at Stonyhurst; on the 10th at Aldershot Camp and Calcethorpe; on the 11th at Hastings and Hull; on the 16th at Cockermouth; on the 20th at Gloucester, Stonyhurst, and Allenheads; on the 21st at Hawarden, Hull, Stonyhurst, Allenheads, and Silloth; on the 22nd at Allenheads; on the 23rd at Gloucester, Hawarden, Eccles, Halifax, and Hull; on the 24th at Osborne, Weybridge Heath, Leicester, Wisbech, Calcethorpe, Stonyhurst, Allenheads, and Silloth; on the 25th at Calcethorpe; on the 27th at Helston and Royston; on the 28th at Guernsey, Somerleyton, Calcethorpe, Eccles, Stonyhurst, Cockermouth, Silloth, and Carlisle; and on the 29th at Oxford and Allenheads. On the 5th and 7th of August at Hull; on the 10th at Streatley, Rayston, and Halifax; on the 13th at Halifax; and on the 29th at Strathfield Turgiss, Royston, Eccles, and Silloth. On the 1st of September at Strathfield Turgiss; on the 2nd at Gloucester, Cockermouth, and Allenheads; on the 4th at Osborne; on the 9th at Leicester, Royston, Somerleyton, Carlisle, and Bywell; on the 10th at Portsmouth, Weybridge Heath, Oxford, and Eccles; on the 21st at Hastings and Eccles; on the 23rd at Somerleyton and Stonyhurst; on the 24th at Calcethorpe; on the 29th at Carlisle; on the 30th at Weybridge Heath.

Lightning was seen, but thunder was not heard, on the 9th of July at Taunton, Weybridge Heath, Oxford, and Cardington; on the 10th at Brighton, Hastings, Weybridge Heath, Oxford, Leicester, and Royston; on the 14th at Silloth; on the 19th at Hastings; on the 22nd at Hawarden and Halifax; and on the 27th at Leicester, Cockermouth, and Carlisle. On the 3rd of August at Allenheads; on the 8th at Oxford and Allenheads; on the 10th at Guernsey, Portsmouth, Oxford, Halifax, Hull, and Leeds; on the 14th at Hull; on the 28th at Carlisle; and on the 29th at Silloth. On the 2nd of September at Cardington, Llandudno, Allenheads, and Silloth; on the 4th at Calcethorpe; on the 5th at North Shields; on the 9th at Portsmouth, Hastings, Salisbury, Halifax, and Allenheads; on the 21st at Somerleyton; on the 22nd and 23rd at Guernsey; on the 27th at Guernsey, Osborne, Portsmouth, Streatley, Oxford, and Cardington; and on the 28th at Hastings.

Solar halos were seen, on the 2nd of July at Halifax; on the 8th at Oxford and Halifax; on the 20th at Streatley, Oxford, and Halifax; and on the 27th at Calcethorpe. On the 7th of August at Wisbech; on the 10th at Calcethorpe; and on the 27th and 30th at Halifax. On the 4th of September at Portsmouth on the 9th at Hastings; on the 10th at Calcethorpe; on the 20th at Oxford; on the 22nd at Hastings.

Lunar halos were seen, on the 29th of August at Portsmouth. On the 22nd of September at Hastings; on the 23rd at Leicester, Wisbech, and Eccles; and on the 26th at Bournemouth and Calcethorpe.

Auroræ boreales were seen, on the 2nd of July at Halifax; and on the 22nd at Streatley. On the 31st of August at Silloth.

Hail fell on 3rd of July at Stonyhurst; on the 21st at Leicester; on the 24th at Weybridge Heath, Norwich, and Wisbech; and on the 28th at Hawarden and Halifax. On the 29th of August at Truro, Oxford, Cockermouth, and Carlisle. On the 2nd and 4th of September at Oxford; on the 8th at Eccles; on the 9th at Truro, Osborne, Royston, Cockermouth, and Silloth; on the 10th at Guernsey, Aldershot Camp, Hull, and Cockermouth; on the 24th at Calcethorpe; on the 29th Cockermouth and Silloth; and on the 30th at Silloth.

Fog prevailed on the 11th of July at Calcethorpe; on the 12th at Allenheads; on the 13th at Hastings, Calcethorpe, and Allenheads; and on the 19th at Weybridge Heath and Wisbech. On the 1st of August at Guernsey; on the 13th and 18th at Allenheads; on the 19th at Guernsey and Oxford; on the 20th at Calcethorpe and Allenheads; on the 21st and 22nd at Oxford; on the 23rd and 25th at Allenheads; and on the 26th at Oxford. On the 2nd of September at Oxford; on the 6th at Allenheads and North Shields; on the 7th at North Shields; on the 8th, 9th, and 11th at Allenheads; on the 13th at Oxford; on the 14th at Portsmouth and Taunton; on the 16th at Portsmouth and Halifax; on the 19th at Portsmouth and Taunton; on the 21st at Allenheads; on the 23rd at Weybridge Heath, Strathfield Turgiss, Oxford, Calcethorpe, and Hull; on the 24th at Weybridge Heath, Strathfield Turgiss, and Gloucester; on the 25th at Portsmouth and Carlisle; on the 26th at Helston, Portsmouth, Calcethorpe, and Carlisle; and on the 27th at Portsmouth, Weybridge Heath, Strathfield Turgiss, Cardington, Carlisle, and North Shields.

Wheat cut, on 16th of July at Brighton; on the 17th at Guernsey; on the 18th at Osborne and Streatley; on the 22nd at Weybridge Heath; on the 23rd at Cardington; on the 27th at Hastings; and on the 29th at Helston. On the 1st of August at Llandudno; on the 3rd at Silloth; on the 10th at North Shields; on the 11th at Calcethorpe; and on the 12th at Bywell.

Barley cut, on the 24th of July at Weybridge Heath; and on the 31st at North Shields. On the 3rd of August at Helston; on the 6th at Bywell; on the 7th at Llandudno; and on the 18th at Calcethorpe.

Oats cut, on the 14th of July at Brighton; and on the 21st at Weybridge Heath. On the 3rd of August at Llandudno; on the 4th at Helston; on the 6th at Bywell; and on the 10th at Calcethorpe.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING SEPTEMBER 30TH, 1874.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat^n. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. E.	Wind. S.	Wind. W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, SAMUEL ELLIOTT HOSKINS, Esq., M.D., F.R.S., F.M.S.	204	July	29·817	0·762	72·0	51·5	20·5	67·6	54·7	10·9	60·3	56·2	·453	5·1	0·8	87	530	—	—	0·9	8	3	8	12	3·9	3·5	10	1·85
		Aug.	29·810	0·814	69·5	51·5	18·0	65·0	56·1	8·9	58·6	54·2	·421	4·7	0·8	85	532	—	—	1·4	7	5	8	11	5·0	4·7	14	1·67
		Sept.	29·743	0·829	72·0	48·0	24·0	64·6	54·7	9·9	54·4	54·7	·429	4·7	0·8	87	531	—	—	1·3	4	5	11	10	4·2	4·2	15	2·09
HELSTON (Cornwall), MATTHEW P. MOYLE, Esq., M.R.C.S.	106	July	29·930	0·715	82·0	42·0	40·0	72·8	54·0	18·8	62·4	55·7	·444	5·0	1·7	75	525	106·1	50·9	1·8	5	4	9	13	4·0	3·5	13	1·78
		Aug.	29·912	1·014	77·0	46·0	31·0	69·4	54·0	15·4	60·1	52·1	·389	4·5	1·4	76	534	97·1	49·9	2·0	6	5	8	12	4·7	4·2	17	3·12
		Sept.	29·838	0·820	76·0	44·0	32·0	66·7	53·1	13·6	58·6	52·5	·396	4·6	1·3	78	532	87·9	51·1	2·0	3	6	12	9	4·9	4·2	20	6·31
TRURO (Cornwall), C. BARHAM, Esq., M.D., F.M.S.	43	July	30·004	0·703	78·0	41·0	37·0	70·0	54·5	15·5	60·6	52·0	·388	4·3	1·6	73	533	—	—	2·4	8	5	6	12	—	6·2	18	1·60
		Aug.	29·970	0·918	79·0	45·0	34·0	68·0	54·0	14·0	59·5	52·9	·401	4·5	1·2	79	534	—	—	2·9	5	5	5	16	—	6·1	16	3·71
		Sept.	29·882	0·794	74·0	39·0	35·0	65·0	52·6	12·4	57·8	52·5	·395	4·4	1·4	82	534	—	—	2·5	5	3	9	13	—	6·4	24	5·90
OSBORNE (Isle of Wight), J. R. MANN, Esq.	172	July	29·828	0·638	88·2	48·2	40·0	76·8	55·0	21·8	64·6	56·2	·453	5·2	1·7	74	526	123·4	51·2	0·6	3	5	10	13	—	4·0	8	0·75
		Aug.	29·802	0·928	84·2	47·5	36·7	70·7	53·5	17·2	60·5	55·8	·446	5·0	0·9	85	529	109·0	50·0	0·2	3	5	11	12	—	5·5	18	2·46
		Sept.	29·750	0·816	75·5	44·8	30·7	67·1	52·3	14·8	58·4	55·7	·445	4·9	0·6	90	531	97·5	48·3	0·1	2	2	13	13	—	6·2	16	2·96
BOURNEMOUTH (Hants), T. A. COMPTON, Esq., M.D., B.A., F.M.S.	128	April	29·892	1·100	70·0	33·0	37·0	57·5	42·7	14·8	49·3	42·1	·268	2·9	1·0	76	544	—	—	—	9	6	7	8	—	2·1	10	2·40
		May	30·002	0·840	68·0	33·9	34·1	59·0	42·7	16·3	50·0	41·0	·257	2·9	1·2	72	545	—	—	—	16	6	2	7	—	3·0	13	1·02
		June	30·142	0·900	74·4	38·8	35·6	65·7	50·4	15·3	56·8	47·6	·330	3·7	1·4	71	540	—	—	—	8	9	6	7	—	2·9	11	1·42
		July	30·010	0·600	75·7	47·1	28·6	71·4	54·1	17·3	61·5	53·9	·415	4·7	1·2	76	532	—	—	—	2	3	11	15	—	2·6	10	1·20
		Aug.	29·958	0·970	73·1	47·5	25·6	67·1	52·6	14·5	58·9	51·5	·382	4·2	1·4	76	531	—	—	—	3	2	10	16	—	3·2	14	2·29
		Sept.	29·907	0·850	67·8	43·8	24·0	63·7	52·0	11·7	57·1	50·3	·363	4·0	1·2	78	537	—	—	—	2	0	10	18	—	2·7	18	2·01
PORTSMOUTH, WILLIAM C. ELLIS, Esq.	16	July	30·026	0·592	—	—	—	—	—	—	—	—	—	—	—	—	—	126·3	51·7	1·3	1	5	16	9	1·5	3·8	7	0·89
		Aug.	29·980	0·950	—	—	—	—	—	—	—	—	—	—	—	—	—	116·3	49·6	1·5	2	4	12	13	1·7	5·4	12	1·55
		Sept.	29·921	0·982	—	—	—	—	—	—	—	—	—	—	—	—	—	106·9	48·3	0·8	3	3	12	12	2·6	6·8	16	2·54
BRIGHTON (Sussex), FREDERICK E. SAWYER, Esq., F.M.S.	200	July	29·801	0·728	80·0	50·4	29·6	72·4	56·1	16·3	63·4	53·0	·404	4·5	2·0	69	527	121·8	54·0	0·7	3	7	10	11	—	5·0	8	1·88
		Aug.	29·782	0·961	74·5	49·8	24·7	67·8	53·9	13·9	60·0	49·8	·350	4·0	1·8	69	530	113·6	51·3	1·3	2	5	10	14	—	5·4	17	1·71
		Sept.	29·744	0·832	72·4	44·6	27·8	65·3	53·1	12·2	58·6	52·6	·396	4·4	1·1	80	531	102·8	50·0	0·8	3	3	10	14	—	7·0	16	3·33
MANOR HOUSE (Hastings), ALEX. E. MURRAY, Esq., F.M.S.	160	July	29·819	0·618	84·8	50·0	34·8	72·5	56·6	15·9	62·8	55·8	·446	4·9	1·4	78	528	—	—	1·6	4	7	11	9	—	4·3	9	0·49
		Aug.	29·804	0·933	75·5	47·5	28·0	67·4	54·4	13·0	60·0	53·6	·411	4·6	1·2	80	530	—	—	1·7	4	4	8	15	—	5·7	16	1·21
		Sept.	29·779	0·914	72·1	44·1	28·0	64·1	54·2	9·9	58·4	53·2	·408	4·5	1·0	83	532	—	—	1·5	4	4	12	10	—	6·1	20	3·06
TAUNTON (Somerset), JAMES BOTTOMLEY, Esq.	80	July	29·930	0·708	93·8	42·5	51·3	77·0	52·3	24·7	63·6	51·9	·386	4·3	2·0	68	529	83·4	40·3	0·3	4	5	7	15	—	6·0	8	0·86
		Sept.	29·823	0·824	78·5	40·0	38·5	67·9	48·1	19·8	57·1	52·7	·400	4·4	0·9	85	534	79·7	39·1	0·3	-	—	—	-	—	7·0	9	2·10
WILTON HOUSE (near Salisbury), T. CHALLIS, Esq.	186	July	29·816	0·696	91·0	41·0	50·0	79·3	48·8	30·5	62·6	54·8	·430	4·8	1·6	76	528	123·8	46·4	1·3	5	2	11	13	4·2	4·4	8	0·96
		Aug.	29·770	1·070	85·0	40·0	45·0	72·5	48·1	24·4	59·4	53·0	·402	4·5	1·2	80	530	115·2	45·5	1·9	3	2	5	21	4·5	6·0	16	2·52
		Sept.	29·704	0·882	77·0	36·0	41·0	68·2	45·9	22·3	56·2	51·0	·375	4·2	1·0	83	532	105·4	42·9	1·5	2	2	10	16	4·5	7·1	17	4·34
BARNSTAPLE (Devon), T. MACKRELL, Esq.	43	July	29·976	0·720	86·0	48·5	37·5	74·1	57·2	16·9	64·3	55·9	·443	4·9	1·9	75	529	—	—	1·1	1	5	13	12	—	3·3	14	2·77
		Aug.	29·804	1·060	83·0	48·5	34·5	69·7	56·0	13·7	61·3	55·8	·444	4·9	1·0	82	530	—	—	1·6	0	6	10	15	—	4·0	21	5·65
		Sept.	29·854	0·840	79·0	48·0	31·0	66·8	53·5	13·3	58·9	55·0	·405	4·5	1·0	81	532	—	—	1·4	1	2	16	11	—	4·3	21	5·98

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Of all Lowest.	Daily Range.	perature. Air.	Dew Point.	Vapour. Elastic Force.	In a Cubic foot of Air. Mean.	Short of Saturation.	Mean Degree of Humidity, Satn.=100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Minimum on Grass.	Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
ALDERSHOT CAMP (Hants), John Arnold, Esq., M.S.C., F.M.S.	325	July	29·635	0·590	91·4	45·0	46·4	80·2	53·3	26·9	64·8	55·4	·439	4·8	1·8	72	522	123·0	49·3	1·7	5	5	10	11	1·5	5·9	7	1·38
		Aug.	29·617	1·018	82·4	42·6	39·8	72·1	50·5	21·6	59·3	49·3	·351	3·9	1·7	70	528	116·2	46·9	1·8	1	5	8	17	1·9	6·5	14	2·41
		Sept.	29·572	0·768	76·6	44·4	32·2	66·8	50·6	16·2	57·0	52·7	·399	4·4	0·9	86	529	100·6	45·7	1·6	2	3	10	15	2·0	6·8	16	2·98
ST. AUGUSTINE'S MONASTERY, (Ramsgate), Rev. E. J. Stutter, O.S.B.	108	July	29·921	0·621	89·5	51·0	38·5	76·8	57·5	19·3	65·5	55·2	·436	4·8	2·1	69	527	121·4	54·4	1·6	6	9	6	10	—	4·5	—	—
		Aug.	29·866	1·008	77·2	47·3	29·9	70·0	54·9	15·1	61·4	53·2	·405	4·5	1·5	75	530	116·6	50·6	2·1	2	7	1	20	—	5·0	—	—
		Sept.	29·851	0·786	79·0	43·2	35·8	67·3	53·1	14·2	59·6	51·9	·387	4·4	1·4	76	532	108·6	52·2	2·0	3	2	7	18	—	4·2	—	—
STRATHFIELD TURGISS (Hants), Rev. C. H. Griffith, M.A., F.M.S.	197	July	29·790	0·659	88·3	42·7	45·6	76·9	55·2	21·7	64·5	52·6	·397	4·4	2·3	65	526	131·8	47·6	0·6	5	5	7	14	5·5	4·9	6	1·08
		Aug.	—	—	82·2	40·0	42·2	73·4	49·8	23·6	60·3	50·9	·373	4·2	1·6	71	532	126·5	45·2	0·5	—	—	—	—	4·5	5·0	—	1·38
		Sept.	29·722	0·868	77·1	41·6	35·5	65·9	49·6	16·3	57·1	51·5	·381	4·3	1·0	82	532	114·3	44·5	0·5	2	5	11	12	4·1	5·4	15	3·33
WEYBRIDGE HEATH (Surrey), William F. Harrison, Esq., F.M.S.	150	July	29·894	0·562	90·5	44·8	45·7	80·0	52·7	27·3	64·0	56·7	·461	5·1	1·5	77	527	119·8	49·1	0·5	—	—	—	—	7·0	3·8	8	0·59
		Sept.	29·790	0·895	80·0	42·0	38·0	68·7	48·9	19·8	57·5	51·8	·386	4·3	1·0	82	533	103·8	46·5	0·5	3	1	16	10	0·8	6·4	14	3·01
MARLBOROUGH COLLEGE (Wilts), Rev. Thomas A. Preston, M.A., F.M.S.	456	July	29·530	0·684	86·6	40·4	46·2	73·5	50·4	23·1	61·7	50·4	·365	4·1	2·0	68	524	149·1	48·2	—	8	3	6	14	—	5·5	11	1·47
		Aug.	29·493	1·008	78·6	38·9	39·7	67·0	50·1	16·9	57·5	49·5	·356	4·0	1·4	75	528	128·0	45·6	—	6	3	7	15	—	6·3	15	2·53
		Sept.	29·447	0·852	74·2	39·2	35·0	63·7	49·0	14·7	55·4	50·5	·368	4·0	0·9	84	529	100·1	44·0	—	2	1	13	14	—	7·3	16	4·40
ROYAL OBSERVATORY (Kent), The Astronomer Royal.	159	July	29·826	0·668	92·0	46·2	45·8	79·0	53·6	25·4	64·4	54·6	·427	4·7	2·0	70	526	140·3	46·4	0·2	3	6	7	15	—	5·7	10	2·59
		Aug.	29·783	1·023	81·2	44·0	37·2	72·1	51·5	20·6	60·1	53·3	·407	4·5	1·3	78	530	125·1	44·4	0·5	3	4	8	16	—	6·8	12	1·44
		Sept.	29·752	0·911	78·1	43·4	34·7	68·4	50·3	18·1	57·9	53·1	·404	4·5	0·8	84	531	113·2	42·7	0·4	1	3	12	14	—	6·8	16	2·22
STREATLEY VICARAGE (Berks), Rev. J. Slatter, M.A., F.R.A.S., F.M.S.	150	July	29·845	0·667	91·5	40·8	50·7	79·6	50·1	29·5	63·5	53·4	·408	4·6	1·9	70	527	89·9	—	1·3	3	6	8	14	—	3·6	11	1·46
		Aug.	29·815	1·031	84·4	42·8	41·6	72·8	50·1	22·7	60·1	52·6	·397	4·5	1·3	76	530	82·4	—	1·6	7	2	7	15	—	5·4	16	1·52
		Sept.	29·768	0·851	79·8	43·4	36·4	67·5	49·1	18·4	57·7	51·6	·385	4·3	0·9	80	532	77·2	—	1·7	3	3	11	13	—	5·4	13	3·25
CAMDEN TOWN (London), G. J. Symons, Esq., F.M.S.	123	July	29·875	0·642	90·8	47·3	43·5	78·4	54·6	23·8	64·6	55·5	·440	4·9	1·6	73	527	125·4	52·4	—	4	4	8	14	—	4·3	11	0·82
		Aug.	29·838	1·039	84·0	45·5	38·5	72·2	52·1	20·1	60·8	53·2	·405	4·5	1·3	76	530	114·0	50·2	—	6	1	7	17	—	5·9	16	1·32
		Sept.	29·800	0·905	78·2	43·3	34·9	68·1	50·7	17·4	58·4	51·5	·380	4·2	1·1	78	532	100·4	48·3	—	3	0	16	11	—	6·2	15	2·62
CHISWICK (London), Prof. Thiselton Dyer.	25	July	29·995	0·666	91·5	40·0	51·5	78·7	50·7	28·0	63·4	51·6	·383	4·3	2·2	68	530	136·5	45·2	—	4	5	12	10	—	—	12	1·81
		Aug.	29·928	1·030	81·2	41·5	39·7	71·8	49·3	22·5	59·5	50·4	·367	4·1	1·4	72	533	129·1	43·2	—	4	5	9	13	—	—	16	1·37
		Sept.	29·897	0·828	88·2	39·2	49·0	69·0	48·8	20·2	58·0	51·8	·385	4·2	1·1	80	534	118·6	42·9	—	2	3	18	7	—	—	10	1·77
TOWN MUSEUM (Leicester), W. J. Harrison, Esq.	245	July	29·721	0·673	84·3	46·0	38·3	73·6	53·6	20·0	62·6	52·2	·392	4·3	2·0	69	526	131·5	45·9	0·7	4	8	7	12	—	5·2	11	1·22
		Aug.	29·651	1·191	81·7	43·6	38·1	67·9	51·4	16·5	58·7	50·2	·365	4·2	1·2	73	529	121·8	44·2	1·0	2	6	8	15	—	6·2	20	2·07
		Sept.	29·617	0·911	74·0	42·0	32·0	64·2	50·2	14·0	56·5	49·0	·350	3·9	1·1	76	531	112·7	44·0	1·0	3	2	13	12	—	6·6	18	2·53
OXFORD (Oxfordshire), Rev. R. Main, M.A., F.R.S., F.R.A.S.	210	July	29·768	0·687	88·1	43·5	44·6	77·4	53·2	24·2	65·4	52·0	·387	4·3	2·6	61	524	129·8	50·1	0·8	4	5	8	14	3·2	6·0	11	0·49
		Aug.	29·715	1·095	79·4	44·9	34·5	70·1	52·2	17·9	60·6	52·4	·394	4·4	1·5	74	528	121·6	48·3	1·1	2	6	7	16	4·4	6·2	16	1·82
		Sept.	29·676	0·899	73·1	43·8	29·3	65·5	50·6	14·9	57·7	51·8	·386	4·3	1·0	81	530	111·6	46·9	0·9	1	5	13	11	2·4	7·6	17	3·34
GLOUCESTER (Gloucester), E. Tuller, Esq., M.D.	100	July	29·933	0·654	90·3	45·4	44·9	78·7	54·8	23·9	65·3	52·3	·391	4·3	2·6	62	527	126·7	49·7	0·4	7	5	6	13	1·2	4·0	9	0·84
		Aug.	29·885	1·072	83·7	42·5	41·2	72·3	53·1	19·2	61·1	53·1	·404	4·4	1·6	75	531	117·5	48·7	0·8	8	2	5	16	0·8	6·0	15	2·00
		Sept.	29·837	0·884	75·9	39·4	36·5	67·2	51·2	16·0	58·2	53·0	·404	4·5	1·0	83	533	106·4	46·8	0·7	5	1	10	14	1·5	6·1	19	4·17
ROYSTON (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	July	29·738	0·609	92·2	43·8	48·4	80·0	51·2	28·8	64·2	53·7	·414	4·6	2·0	68	525	—	—	—	5	6	10	10	—	5·2	7	0·53
		Aug.	29·683	1·091	86·0	39·9	46·1	72·7	49·4	23·3	59·8	52·5	·395	4·4	1·3	77	528	—	—	—	5	2	8	16	—	6·4	14	1·17
		Sept.	29·656	0·866	77·6	42·1	35·5	68·5	49·1	19·4	57·4	51·5	·381	4·3	1·0	81	530	—	—	—	2	1	14	13	—	5·8	14	2·80
CARDINGTON (near Bedford), Mr. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	100	July	29·877	0·696	91·6	44·4	47·2	79·5	52·6	26·9	66·4	53·0	·402	4·5	2·6	62	525	122·5	45·7	1·1	3	7	5	16	—	4·7	8	1·16
		Aug.	29·826	1·140	83·0	40·0	43·0	72·3	50·0	22·3	60·8	53·0	·402	4·5	1·2	76	530	106·4	43·9	2·7	4	3	6	18	—	5·6	13	1·37
		Sept.	29·796	0·866	77·0	40·0	37·0	67·2	49·1	18·1	57·5	53·7	·415	4·7	0·7	87	533	93·1	43·2	2·1	2	2	11	15	—	6·3	15	3·20
ST. DAVID'S COLLEGE, LAMPETER (Cardiganshire), Prof. A. W. Scott.	420	Aug.	29·555	1·090	82·5	39·0	43·5	68·0	47·4	20·6	58·0	51·8	·372	4·2	1·2	80	527	97·0	—	0·6	0	2	19	10	—	7·2	19	4·36
		Sept.	29·512	0·790	77·0	31·0	46·0	63·3	42·8	20·5	54·0	48·1	·334	3·8	0·9	80	532	89·0	—	0·5	0	1	18	11	—	6·2	15	6·04

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean. Of all Highest.	Temperature of Air in Month. Mean. Of all Lowest.	Temperature of Air in Month. Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	July	29·930	0·652	87·4	42·9	44·5	76·0	53·4	22·6	62·8	54·5	·425	4·6	1·6	75	530	—	42·7	1·0	4	7	11	9	3·6	3·8	12	1·10
		Aug.	29·877	1·224	81·0	40·8	40·2	70·5	51·8	18·7	59·5	49·7	·364	4·0	1·7	70	533	—	40·9	1·2	6	4	8	13	4·1	5·1	11	1·76
		Sept.	29·856	0·942	81·1	36·2	44·9	67·7	50·3	17·4	57·8	53·8	·415	4·6	0·7	86	534	—	39·9	1·1	3	1	14	12	5·4	5·2	16	3·48
NORWICH (Norfolk), John Quinton, Esq., Jun.	42	July	29·934	0·668	88·0	47·0	41·0	75·3	54·4	20·9	63·7	56·6	·459	5·1	1·5	78	528	—	—	—	5	8	10	8	—	—	8	1·58
		Aug.	—	—	80·5	40·5	40·0	68·0	50·6	17·4	58·4	54·2	·421	4·7	0·8	86	530	—	—	—	4	1	11	15	—	—	10	1·85
		Sept.	29·850	0·924	76·0	38·0	38·0	65·3	49·7	15·6	57·0	54·7	·428	4·7	0·5	92	534	—	—	—	1	2	17	10	—	—	11	2·36
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	July	29·951	0·700	90·8	44·3	46·5	77·7	52·6	25·1	64·8	54·0	·418	4·6	2·0	69	528	130·6	48·7	0·5	6	5	11	9	2·6	5·2	9	1·31
		Aug.	29·888	1·212	83·4	43·0	40·4	70·4	50·1	20·3	59·2	51·8	·386	4·4	1·3	78	533	120·4	47·0	1·0	4	2	11	14	3·7	6·0	15	2·06
		Sept.	29·867	0·896	74·6	40·8	33·8	66·5	49·8	16·7	57·0	53·2	·405	4·5	0·7	87	534	108·7	45·7	0·8	2	2	14	12	3·4	6·2	14	2·78
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	July	29·851	0·710	81·3	46·0	35·3	73·2	55·2	18·0	62·5	54·2	·420	4·6	1·6	75	528	—	—	0·6	4	3	11	13	—	5·8	11	1·97
		Aug.	29·778	1·280	77·9	49·3	28·6	69·1	54·2	14·9	60·6	53·0	·407	4·5	1·3	76	529	—	—	0·8	2	5	5	19	—	6·0	17	2·81
		Sept.	29·722	0·990	74·3	45·0	29·3	65·2	51·6	13·6	57·2	50·3	·366	4·1	1·1	78	532	—	—	0·8	3	2	7	18	—	5·9	17	2·53
DERRY (Derbyshire), John Davis, Esq.	174	July	29·760	0·776	86·0	47·0	39·0	75·1	53·9	21·2	63·2	51·8	·385	4·3	2·2	66	526	—	—	—	5	3	6	17	—	—	14	1·28
		Aug.	29·704	1·168	81·0	45·0	36·0	68·2	52·0	16·2	58·7	52·7	·396	4·4	0·9	80	530	—	—	—	4	5	5	17	—	—	—	2·54
		Sept.	29·670	0·896	71·0	41·0	30·0	62·9	50·1	12·8	56·3	51·7	·382	4·2	1·0	84	532	—	—	—	3	0	11	16	—	—	—	2·64
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	183	July	29·756	0·676	86·7	44·3	42·4	76·2	52·2	24·0	62·7	52·3	·393	4·4	2·0	69	527	130·3	44·0	0·4	4	3	10	14	2·6	5·5	12	0·75
		Aug.	29·688	1·210	83·6	39·9	43·7	69·8	49·9	19·9	58·2	52·2	·391	4·4	1·0	80	530	111·6	41·8	0·7	1	3	10	17	4·8	6·6	20	1·96
		Sept.	29·654	0·860	74·2	41·1	33·1	65·5	48·8	16·7	56·4	51·6	·383	4·3	0·8	84	531	101·3	40·3	0·7	2	4	12	12	3·7	6·2	22	2·25
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	July	29·913	0·688	90·7	40·5	50·2	80·3	50·4	29·9	64·0	53·0	·403	4·5	2·1	67	528	142·9	45·1	1·3	10	5	8	8	—	5·2	8	0·61
		Aug.	29·839	1·194	80·4	35·0	45·4	71·5	48·5	23·0	58·8	49·7	·357	4·0	1·5	80	532	134·8	43·8	1·7	7	2	9	13	—	6·8	16	1·65
		Sept.	29·818	0·895	74·8	33·8	41·0	69·8	48·2	21·6	58·1	51·2	·379	4·3	1·1	79	533	116·9	41·8	1·6	4	2	15	9	—	6·0	12	2·02
CALCETHORPE MANOR (near) Louth (Lincolnshire), D. Grant Briggs, Esq., F.M.S.	382	June	29·700	0·935	76·7	36·7	40·0	65·0	46·5	18·5	54·1	47·0	·321	3·6	1·2	77	535	124·7	41·4	0·7	9	6	7	8	6·2	6·3	8	1·09
		July	29·561	0·698	85·5	45·0	40·5	72·3	51·4	20·9	60·1	51·7	·384	4·3	1·9	74	526	130·2	45·0	0·5	3	4	13	11	5·8	5·7	15	1·34
		Aug.	29·477	1·268	79·9	40·1	39·8	65·9	48·5	17·4	55·8	49·6	·356	4·0	1·0	80	529	117·9	42·2	0·9	4	2	11	14	5·9	6·8	21	2·65
		Sept.	29·444	0·899	71·5	37·4	34·1	63·2	48·3	14·9	54·6	50·3	·365	4·1	0·5	85	529	112·0	41·7	0·9	3	1	18	8	6·2	6·1	16	2·59
HAWARDEN (Flint), T. Moffat, Esq., M.D., F.R.A.S.	270	July	29·666	0·692	85·5	50·5	35·0	71·2	58·1	13·1	62·4	55·7	·441	4·9	1·3	79	525	146·5	39·5	2·1	7	2	8	14	0·4	5·5	14	2·57
		Sept.	29·532	0·873	72·0	44·5	27·5	62·9	52·8	10·1	56·1	50·2	·365	4·1	0·9	81	530	104·2	33·9	2·2	4	1	12	13	0·6	6·0	15	1·99
ECCLES (near Manchester), T. Mackereth, Esq., F.R.A.S., F.M.S.	145	July	29·803	0·696	87·4	45·3	42·1	73·3	51·2	22·1	61·1	53·3	·407	4·6	1·5	76	529	92·3	44·7	0·3	5	1	7	18	1·6	5·5	17	2·14
		Aug.	29·720	1·270	83·1	41·8	41·3	67·6	50·5	17·1	57·8	52·2	·391	4·4	1·0	82	531	80·5	43·7	0·5	5	3	8	15	2·6	7·1	20	5·77
		Sept.	29·686	0·930	78·3	39·8	38·5	64·5	48·6	15·9	55·5	49·5	·355	4·0	1·0	81	533	76·5	41·4	0·5	2	2	13	13	1·8	6·2	23	3·48
MOOR SIDE OBSERVATORY, HALIFAX (Yorkshire), Louis J. Crossley, Esq., F.R.A.S.	429	July	29·454	0·678	82·5	45·3	37·2	71·4	52·8	18·6	61·0	49·8	·358	4·0	2·0	67	523	109·8	46·6	0·6	6	5	7	13	1·0	6·1	12	3·02
		Aug.	29·362	1·233	76·8	43·0	33·8	65·9	50·9	15·0	56·8	50·7	·370	4·1	1·1	79	526	102·3	45·8	1·0	5	5	5	16	2·8	6·7	16	2·75
		Sept.	29·339	0·872	71·6	37·7	33·9	62·5	49·6	12·9	54·4	49·6	·355	4·0	0·8	84	528	99·4	43·5	0·8	3	3	9	15	2·0	7·1	20	2·52
BERMERSIDE OBSERVATORY, HALIFAX (Yorkshire), Edward Crossley, Esq., F.R.A.S.	520	July	29·398	0·694	81·8	44·5	37·3	71·6	50·6	21·0	60·3	51·8	·385	4·3	1·6	74	523	113·8	—	0·7	1	6	8	16	—	5·0	8	3·43
		Aug.	29·278	0·950	74·0	37·5	36·5	63·1	48·1	15·0	54·1	49·2	·349	4·0	0·7	84	527	103·3	45·4	0·9	1	4	11	14	—	6·5	19	2·32
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	July	29·947	0·700	84·0	44·0	40·0	73·2	51·5	21·7	61·0	55·4	·439	4·9	1·1	82	531	101·4	50·0	—	—	—	—	—	1·0	—	13	1·85
		Aug.	29·860	1·292	78·0	40·0	38·0	67·0	48·9	18·1	57·3	52·6	·396	4·3	0·9	84	534	94·0	46·2	—	—	—	—	—	1·4	—	18	2·56
		Sept.	29·840	0·840	74·0	40·0	34·0	64·4	49·2	15·2	56·2	51·0	·375	4·2	0·8	88	535	88·7	46·7	—	—	—	—	—	0·5	—	15	2·11
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	363	July	29·551	0·714	83·0	41·3	41·7	71·8	51·8	19·5	60·0	54·8	·430	4·8	1·0	86	526	129·8	48·7	—	6	3	8	14	—	6·8	16	3·05
		Aug.	29·464	1·267	80·8	40·2	40·6	65·8	50·2	15·6	56·3	51·8	·386	4·3	0·7	85	528	121·2	46·6	—	4	4	8	15	—	7·2	22	7·21
		Sept.	29·418	1·012	73·0	38·2	34·8	62·9	47·9	15·0	54·3	49·2	·347	4·0	0·9	82	530	114·6	43·7	—	3	2	14	11	—	7·3	23	5·63
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	July	29·545	0·680	80·9	46·9	34·0	71·1	54·4	16·7	61·1	53·4	·409	4·6	1·4	76	525	98·7	—	0·7	—	—	—	—	—	5·9	12	1·89
		Aug.	29·453	1·274	78·2	46·0	32·2	66·2	53·3	12·9	57·7	52·6	·397	4·4	0·9	85	529	90·8	—	1·2	—	—	—	—	—	5·9	17	2·41
		Sept.	29·396	0·898	72·6	41·2	31·4	63·5	50·8	12·7	53·2	50·4	·367	4·2	0·9	81	527	84·6	—	0·9	—	—	—	—	—	5·8	15	2·19

OBSERVERS.	Height above S	Months.	Mean.	Range.	Highest.	Lowest.	Range.	Of all High	Of all Low	Daily Ran	Air.	Dew Point	Elastic Fo	Mean.	Short of Saturatio	Mean Deg dity. S	Mean W. cubic foo	Maximum Rays of S	Minimum Grass.	Estimated Strength	N.	E.	S.	W.	Mean Ai Ozone.	Mean Ai Cloud.	Number o it fell.	Amount lected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
LEEDS PHILOSOPHICAL HALL (Yorkshire), LOUIS C. MIALL, ESQ.	137	July	29·795	0·686	90·0	48·0	42·0	76·0	54·1	21·9	64·2	52·8	·400	4·5	2·2	66	526	83·3	–	1·2	7	3	6	15	–	6·7	18	2·54
		Aug.	29·703	1·262	84·0	44·0	40·0	68·8	51·4	17·4	59·2	49·7	·358	4·1	1·6	71	530	76·7	–	1·2	6	2	5	18	–	7·1	19	1·79
		Sept.	29·675	0·930	75·0	42·0	33·0	65·4	50·2	15·2	56·8	50·0	·363	4·2	0·8	77	531	74·3	–	1·2	2	1	10	17	–	6·7	17	1·87
COCKERMOUTH (Cumberland), H. DODGSON, ESQ., M.D., F.R.A.S., F.M.S.	146	July	29·752	0·722	81·6	44·2	37·4	69·5	51·4	18·1	59·8	51·4	·380	4·3	1·3	74	530	119·5	47·1	0·4	3	5	11	12	1·4	5·8	16	2·65
		Aug.	29·656	1·295	76·1	44·3	31·8	65·3	52·6	12·7	57·5	51·4	·382	4·4	0·9	79	530	105·9	46·2	0·6	4	5	6	16	1·5	6·1	22	6·76
		Sept.	29·619	1·008	66·4	37·6	28·8	61·3	50·0	11·3	54·8	47·9	·330	3·9	1·0	76	533	99·3	40·9	0·8	2	5	12	11	2·2	6·5	22	5·86
ALLENHEADS (Northumberland), MR. T. KIDD, Assistant to W. B. BEAUMONT, ESQ., M.P.	1360	July	28·521	0·668	80·5	40·0	40·5	69·0	50·0	19·0	57·4	51·9	·387	4·3	1·0	82	510	124·6	45·5	1·4	–	–	–	–	–	5·5	12	1·88
		Aug.	28·412	1·230	76·0	41·0	35·0	63·2	47·1	16·1	52·8	48·4	·340	3·9	0·6	85	513	114·5	43·7	1·6	–	–	–	–	–	6·3	20	4·80
		Sept.	28·350	0·888	64·0	33·5	30·5	58·1	44·7	13·4	49·9	46·0	·311	3·5	0·5	87	515	98·3	42·4	1·9	–	–	–	–	–	6·6	19	4·31
SILLOTH RECTORY (Cumberland), REV. FRANCIS REDFORD, M.A., F.R.A.S., F.M.S.	28	July	29·881	0·711	83·5	46·9	36·6	73·5	53·7	19·8	61·8	54·2	·419	4·7	1·5	77	530	112·1	49·6	1·1	2	4	5	20	6·7	5·5	14	2·96
		Aug.	29·784	1·310	79·3	43·2	36·1	69·3	51·6	17·7	58·4	52·4	·393	4·4	1·0	80	532	104·0	47·7	1·2	4	6	5	16	8·0	6·4	21	5·62
		Sept.	29·739	1·033	70·3	37·0	33·3	65·4	48·4	17·0	55·8	49·0	·349	4·0	1·0	79	534	98·7	44·5	1·4	0	5	10	15	9·3	5·8	20	3·93
CARLISLE (Cumberland), J. CARTMELL, ESQ., F.M.S.	114	July	29·809	0·692	81·2	41·2	40·0	71·4	51·2	20·2	60·7	50·6	·369	4·1	1·7	71	530	108·1	45·9	2·0	2	4	6	19	5·1	6·1	17	2·40
		Aug.	29·704	1·247	77·0	40·1	36·9	66·5	48·6	17·9	56·7	50·6	·372	4·2	0·9	80	532	99·8	44·3	2·4	4	5	5	17	6·0	6·4	20	6·95
		Sept.	29·656	1·001	67·3	36·9	30·4	62·6	48·0	14·6	54·2	48·3	·338	3·9	0·9	80	534	92·2	42·2	2·0	2	4	11	13	6·3	6·1	21	4·01
BYWELL (Northumberland), MR. JOHN DAWSON, Assistant to W. B. BEAUMONT, ESQ., M.P.	87	July	29·788	0·668	84·0	46·0	38·0	72·4	56·2	16·2	62·4	51·3	·378	4·2	1·9	67	528	105·5	50·0	1·3	4	7	4	16	–	3·0	18	1·72
		Aug.	29·680	1·312	82·0	47·0	35·0	69·7	52·3	17·4	58·5	53·1	·402	4·5	1·1	82	530	93·6	45·6	1·6	3	6	6	16	–	5·4	19	2·60
		Sept.	29·642	0·956	75·0	42·0	33·0	64·8	49·6	15·2	55·5	46·7	·320	3·6	1·3	72	532	79·3	42·7	1·4	5	3	5	17	–	4·7	17	2·63
NORTH SHIELDS (Northumberland), ROBERT SPENCE, ESQ.	124	July	29·800	0·738	75·2	45·0	30·2	67·4	54·8	12·6	59·6	51·7	·385	4·4	1·4	75	531	–	52·6	1·2	2	6	5	18	–	6·6	11	1·47
		Aug.	29·729	1·230	74·3	43·0	31·3	64·0	50·5	13·5	56·3	46·1	·313	3·5	1·6	68	533	–	49·6	1·7	9	3	4	15	–	6·6	18	1·55
		Sept.	29·692	1·078	67·0	41·0	26·0	60·8	48·8	12·0	53·6	46·9	·320	3·7	1·0	77	535	–	47·0	1·7	6	2	5	17	–	6·4	17	1·76
MILTOWN (Banbridge, Ireland), JOHN SMYTH, ESQ., jun., M.A., M.I.C.E.I.	200	July	29·572	0·696	77·0	43·0	34·0	68·6	52·3	16·3	59·3	50·5	·372	4·1	1·5	74	528	114·2	47·4	1·7	5	1	19	6	–	5·1	19	2·89
		Aug.	29·499	1·110	77·0	43·0	34·0	65·8	50·1	15·7	56·5	50·2	·367	4·2	1·0	80	529	110·0	46·2	2·1	5	2	17	7	–	6·7	20	4·41
		Sept.	29·415	1·016	63·0	38·0	25·0	59·6	47·2	12·4	53·2	46·6	·320	3·6	1·0	78	531	96·4	42·6	2·6	4	1	18	7	–	5·8	20	2·95

NOTE.—*The Barometer Reading*, HELSTON, 2nd July, 3h. p.m., 30·808 in., has been altered to 29·808 in.
" HULL, 3rd Aug., 5h. p.m., 29·040 in., " 30·040 in.
" BRADFORD, 18th " 3h. p.m., 29·990 in., " 29·490 in.
" " 31st " 9h. a.m., 30·316 in., " 29·316 in.
" SOMERLEYTON, 11th Sept., 9h. a.m., 30·268 in., " 29·768 in.
" LEEDS, 19th " 4h. p.m., 28·820 in., " 29·820 in.
The Wet Bulb Thermometer, CHISWICK, 22nd Aug., 9h. a.m., 36°7, has been altered to 56°7.

NOTE.—STRATHFIELD TURGISS, August. The observations for the month of August have been deduced from 18 days observations, viz., 1st and 2nd, and from 16th to 31st (inclusive).
TAUNTON, September. " September " 19 " viz., from 12th to 30th (inclusive).

Second Rain-gauges are placed—

	Height	July.		August.		September.		Total during the Quarter.
At Portsmouth, at the height of	20 feet *above the ground*, the amount collected was	0·86 inches.	-	1·22 inches.	-	2·35 inches.	-	4·43 inches.
" Strathfield Turgiss, "	38 feet " "	0·73	-	0·95 "	-	2·29 "	-	3·97 "
" Eccles (Manchester), "	34 feet " "	1·82 "	-	4·76 "	-	2·77 "	-	9·35 "
" Carlisle, "	8 feet " "	4·54 "	-	3·18 "	-	2·35 "	-	10·07 "
" Miltown (Ireland), "	40 feet " "	2·52 "	-	4·26 "	-	— "	-	— "
" Oxford, "	22 feet " "	0·49 "	-	1·72 "	-	3·36 "	-	5·57 "
" Marlborough College, "	8 inches " "	1·41 "	-	2·55 "	-	4·33 "	-	8·29 "
" " "	1 foot " "	1·37 "	-	2·52 "	-	4·28 "	-	8·17 "
" Cardington, "	36 feet " "	0·90 "	-	1·10 "	-	2·90 "	-	4·90 "
" Nottingham, "	39 feet " "	0·62 "	-	1·75 "	-	2·19 "	-	4·56 "
" Wisbech, "	8 feet " "	1·30 "	-	2·01 "	-	2·77 "	-	6·08 "
" Aldershot Camp, "	25 feet " "	1·19 "	-	1·80 "	-	2·33 "	-	5·41 "

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°					
Guernsey	29·576	72·0	48·0	24·0	65·7	55·8	20·8	9·9	59·1	55·0	·484	4·8	0·8	86	531	—	—	1·2	6	4	9	11
Helston	29·597	82·0	42·0	40·0	69·6	53·7	34·3	15·9	60·4	53·4	·410	4·7	1·5	76	530	97·0	50·6	1·9	5	5	10	11
Truro	29·600	79·0	39·0	40·0	67·7	53·7	35·3	14·0	59·5	52·5	·395	4·4	1·4	78	534	—	—	2·6	6	4	7	14
Osborne	29·528	88·2	44·8	43·4	71·5	53·6	35·8	17·9	61·2	55·9	·448	5·0	1·1	83	529	110·0	49·8	0·3	3	4	11	13
Bournemouth	—	75·7	43·8	31·9	67·4	52·9	26·1	14·5	59·2	51·9	·387	4·3	1·3	77	534	—	—	—	2	2	10	16
Portsmouth	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	116·5	49·9	1·2	2	4	13	11
Brighton	29·614	80·0	44·6	35·4	68·5	54·4	27·4	14·1	60·7	51·8	·386	4·3	1·6	73	529	112·7	51·8	0·9	3	5	10	13
Hastings	29·572	84·8	44·1	40·7	68·0	55·1	30·3	12·9	60·4	54·2	·422	4·7	1·2	80	530	—	—	1·6	4	5	10	11
Salisbury	29·563	91·0	36·0	55·0	73·3	47·6	45·3	25·7	59·4	52·9	·402	4·5	1·5	80	530	114·8	44·9	1·6	3	2	9	17
Barnstaple	29·523	86·0	48·0	38·0	70·2	55·6	34·3	14·6	61·5	54·9	·431	4·8	1·3	79	530	—	—	1·4	1	4	13	13
Aldershot Camp	29·536	91·4	42·6	48·8	73·0	51·5	39·5	21·5	60·4	52·5	·396	4·4	1·5	76	526	113·3	47·3	1·7	3	4	9	14
Ramsgate	29·586	89·5	43·2	46·3	71·4	55·2	34·7	16·2	62·2	53·4	·409	4·6	1·7	73	530	115·5	52·4	1·9	4	6	5	16
Strathfield Turgiss	—	88·3	40·0	48·3	72·1	51·5	41·1	20·6	60·6	51·7	·384	4·3	1·6	73	530	124·2	45·8	0·5	—	—	—	—
Marlborough College	29·611	86·6	38·9	47·7	68·1	49·8	40·3	18·3	58·2	50·1	·363	4·0	1·4	76	527	125·7	45·9	—	5	2	9	14
Royal Observatory	29·546	92·0	43·4	48·6	73·2	51·8	39·2	21·4	60·8	53·7	·415	4·6	1·4	77	529	126·2	44·5	0·4	2	4	9	15
Streatley Vicarage	29·575	91·5	40·8	50·7	73·3	49·8	42·9	23·5	60·4	52·5	·397	4·5	1·4	75	530	83·2	—	1·5	4	4	9	14
Camden Town (Lndn.)	29·559	90·8	43·3	47·5	72·9	52·5	39·0	20·4	61·3	53·4	·408	4·5	1·3	76	530	113·3	50·3	—	4	2	10	14
Chiswick	29·589	91·5	39·2	52·3	73·2	49·6	46·7	23·6	60·3	51·3	·378	4·2	1·6	73	532	128·1	43·8	—	3	4	13	10
Leicester	29·554	84·3	42·0	42·3	68·6	51·7	36·1	16·9	59·3	50·5	·369	4·1	1·4	73	529	122·0	44·7	0·9	3	5	9	13
Oxford	29·558	88·1	43·5	44·6	71·0	52·0	36·1	19·0	61·2	52·1	·389	4·3	1·7	72	527	121·0	48·4	0·9	2	5	9	14
Gloucester	29·593	90·3	39·4	50·9	72·7	53·0	40·9	19·7	61·5	52·8	·400	4·4	1·7	73	530	116·9	48·4	0·6	7	3	7	14
Royston	29·490	92·2	39·9	52·3	73·7	49·9	43·3	23·8	60·5	52·6	·397	4·4	1·4	75	528	—	—	—	4	3	11	13
Cardington	29·535	91·6	40·0	51·6	73·0	50·6	42·4	22·4	61·6	53·2	·406	4·6	1·5	75	529	107·3	44·3	2·0	3	4	7	16
Somerleyton Rectory	29·542	87·4	36·2	51·2	71·4	51·8	43·2	19·6	60·0	52·7	·401	4·4	1·3	77	532	—	41·2	1·1	4	4	11	11
Norwich	—	88·0	38·0	50·0	69·5	51·6	39·7	17·9	59·7	55·2	·436	4·8	0·9	85	531	—	—	—	3	4	13	11
Wisbech	29·514	90·8	40·8	50·0	71·5	50·8	40·2	20·7	60·3	53·0	·403	4·5	1·3	73	532	119·9	47·1	0·8	4	3	12	12
Llandudno	29·495	81·3	45·0	36·3	69·2	53·7	31·1	15·5	60·1	52·5	·398	4·4	1·3	76	530	—	—	0·7	3	3	8	17
Derby	29·510	86·0	41·0	45·0	68·7	52·0	35·0	16·7	59·4	52·1	·388	4·3	1·4	77	529	—	—	—	4	3	7	17
Nottingham	29·508	86·7	39·9	46·8	70·5	50·3	39·7	20·2	59·1	52·0	·389	4·4	1·3	78	529	114·4	42·0	0·6	2	3	11	14
Holkham	29·520	90·7	33·8	56·9	73·9	49·0	45·5	24·9	60·3	51·3	·380	4·3	1·6	75	531	131·5	43·6	1·5	7	3	11	10
Caleethorpe	29·535	85·5	37·4	48·1	67·1	49·4	38·1	17·7	56·8	50·5	·368	4·1	1·1	80	528	120·0	43·0	0·8	3	2	14	11
Eccles	29·510	87·4	39·8	47·6	68·5	50·1	40·6	18·4	58·1	51·7	·384	4·3	1·2	80	531	83·1	43·3	0·4	4	2	9	15
Moorside, Halifax	29·483	82·5	37·7	44·8	66·6	51·1	35·0	15·5	57·4	50·0	·361	4·0	1·3	77	526	103·8	45·3	0·8	5	4	7	15
Hull	29·492	84·0	40·0	44·0	68·2	49·9	37·3	18·3	58·2	53·0	·403	4·5	0·9	83	533	94·7	47·6	—	—	—	—	—
Stonyhurst	29·478	83·0	38·2	44·8	66·7	50·0	39·0	16·7	56·9	51·9	·388	4·4	0·9	83	528	121·9	46·3	—	4	3	10	13
Bradford	29·525	80·9	41·2	39·7	66·9	52·5	32·5	14·4	58·3	52·1	·391	4·4	1·1	80	526	91·4	—	0·9	—	—	—	—
Leeds	29·496	90·0	42·0	48·0	70·1	51·9	38·3	18·2	60·1	50·8	·374	4·3	1·5	71	529	78·1	—	1·2	5	2	7	17
Cockermouth	29·471	81·6	37·6	44·0	65·4	51·3	32·7	14·1	57·4	50·2	·364	4·2	1·1	76	531	108·2	44·7	0·6	3	5	10	13
Allenheads	29·507	80·5	33·5	47·0	63·4	47·3	35·3	16·1	53·4	48·8	·346	3·9	0·7	85	513	112·5	43·9	1·6	—	—	—	—
Silloth	29·445	83·5	37·0	46·5	69·4	51·2	35·3	18·2	58·7	51·9	·387	4·4	1·2	79	532	104·9	47·3	1·2	2	5	7	17
Carlisle	29·485	81·2	36·9	44·3	66·8	49·3	35·8	17·6	57·2	49·8	·360	4·1	1·2	77	532	100·0	44·1	2·1	3	4	7	16
Bywell	29·430	84·0	42·0	42·0	69·0	52·7	35·3	16·8	58·8	50·4	·367	4·1	1·4	74	530	92·8	46·1	1·4	4	5	5	16
North Shields	—	75·2	41·0	34·2	64·1	51·4	29·2	12·7	56·5	48·2	·339	3·9	1·3	73	533	—	49·7	1·5	6	4	5	17
Miltown (Ireland)	—	77·0	38·0	39·0	64·7	49·9	31·0	14·8	56·3	49·1	·353	4·0	1·2	77	529	106·9	45·4	2·1	5	1	18	7

The highest temperatures of the air were at Royston, 92°·2; and the Royal Observatory, 92°·0.
The lowest temperatures of the air were at Allenheads, 33°·5; and Holkham, 33°·8.
The greatest daily ranges of the temperatures of the air were at Salisbury, 25°·7; and Holkham, 24°·9.
The least daily ranges of the temperatures of the air were at Guernsey, 9°·9; and North Shields, 12°·7.
The greatest numbers of rainy days were at Stonyhurst, 61; Eccles and Cockermouth, both 60.
The least numbers of rainy days were at Norwich, 29; Portsmouth and Royston, 33 respectively.
The heaviest falls of rain were at Stonyhurst, 15·89 inches; and Cockermouth, 15·21 inches.
The least falls of rain were at Holkham, 4·28 inches; and Royston, 4·50 inches.

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°					
Guernsey	29·576	72·0	48·0	24·0	65·7	55·8	20·8	9·9	59·1	55·0	·434	4·8	0·8	86	531	—	—	1·2	6	4	9	10
Between the latitudes 50° and 51°	29·582	81·6	43·0	38·6	68·8	53·9	31·5	14·9	60·2	53·3	·408	4·6	1·3	78	531	106·0	50·4	1·4	4	4	10	13
51° and 52°	29·568	89·3	41·6	47·7	71·8	51·7	39·7	20·1	60·6	52·4	·395	4·4	1·5	75	529	117·0	47·0	1·1	3	4	10	14
52° and 53°	29·514	88·3	39·4	48·9	71·3	51·2	40·0	20·1	60·1	52·7	·400	4·5	1·3	77	530	118·3	43·6	1·1	4	3	10	13
53° and 54°	29·503	84·8	39·5	45·3	67·7	50·7	37·3	17·0	58·0	51·4	·381	4·3	1·1	79	529	99·0	45·1	0·8	4	3	9	14
54° and 55°	29·468	82·2	37·4	44·8	66·8	50·4	34·9	16·4	57·1	50·2	·365	4·1	1·1	78	528	103·7	45·2	1·4	3	5	7	16
North Shields	—	75·2	41·0	34·2	64·1	51·4	29·2	12·7	56·5	48·2	·339	3·9	1·3	73	533	—	49·7	1·5	6	4	5	17
Miltown, Banbridge (Ireland)	—	77·0	38·0	39·0	64·7	49·9	31·0	14·8	56·3	49·1	·353	4·0	1·2	77	529	106·9	45·4	2·1	5	1	18	7
Mean for the Quarter, 50° to 55°, Year 1871	29·517	84·5	36·9	47·6	67·0	50·2	37·0	16·8	58·9	52·2	·394	4·4	1·2	79	530	108·7	46·8	1·0	5	6	8	12
" 1872	29·489	85·2	34·3	50·9	68·9	52·2	41·4	16·7	59·3	52·7	·403	4·5	1·2	79	529	108·7	46·4	1·1	[illegible]	5	8	12
" 1873	29·536	87·5	36·6	50·9	67·9	51·3	37·5	16·6	58·4	51·9	·389	4·3	1·2	79	529	103·9	45·5	1·0	[illegible]	3	9	15
" 1874	29·527	85·3	40·2	45·1	49·3	51·6	36·7	17·7	59·2	52·0	·389	4·4	1·3	78	529	105·8	46·2	1·2	4	4	9	14

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING DECEMBER 31, 1874.

REMARKS ON THE WEATHER DURING THE QUARTER ENDING DECEMBER 31ST, 1874.

By JAMES GLAISHER, ESQ., F.R.S., *&c.*

The warm period which began on 20th September ended on 1st October, and was followed by eight days of cold weather; the deficiency of daily mean temperature was on the average 4°. From 10th October to 20th November the weather was warm, with the exception of the few days from 20th October to 24th October, and from 11th November to 14th November, which were cold. The average daily temperature of the 42 days ending 20th November was 49°·1, exceeding the average by 2°·4. The excess over the average on some days was as large as 8° or 9°. On 21st November a severe cold period set in and continued with very slight exceptions till 1st January 1875; the average daily temperature of the 42 days ending on this day was 33°·5, being 6°·6 below the average. The temperature on several days was more than 10° in defect; on 10th and 22nd December it was about 12°; on 23rd December it was 14¼°; on 29th December 12½°; on 30th December 12¾°; and on the last day of the year it was as large as 16½° nearly. On this day the mean temperature was 21°·1 only; the day being painfully cold. The following are all the instances of mean daily temperatures of about the same value or less than 21°·1, with the average temperatures for the same days, and departures below their averages, back to the year 1814.

Year.	Date.	Temperature. Average of 50 Years.	Mean of Day.	Departure below average.	Year.	Date.	Temperature. Average of 50 Years.	Mean of Day.	Departure below average.	Year.	Date.	Temperature. Average of 50 Years.	Mean of Day.	Departure below average.
		°	°	°			°	°	°			°	°	°
1814	Jan. 10	35·9	19·6	16·3	1830	Jan. 18	36·7	18·1	18·6	1838	Jan. 20	37·0	10·7	26·3
1814	„ 14	36·3	21·0	15·3	1830	„ 31	37·9	20·0	17·9	1841	„ 7	35·8	17·4	18·4
1814	Dec. 24	37·8	20·9	16·9	1830	Feb. 2	37·7	17·0	20·7	1841	„ 8	35·7	12·8	22·9
1815	Jan. 14	34·3	16·2	20·1	1830	„ 3	37·8	19·2	18·6	1841	„ 9	35·8	20·9	14·9
1815	„ 24	37·9	20·9	17·0	1830	„ 5	38·3	19·0	19·3	1841	Feb. 3	37·8	19·2	18·6
1816	Feb. 8	38·9	19·7	19·2	1830	„ 6	38·6	18·7	19·9	1845	„ 12	38·4	19·2	19·2
1816	„ 9	38·9	12·6	26·3	1830	Dec. 24	37·8	20·9	16·9	1848	Jan. 28	38·4	21·0	17·4
1819	Dec. 11	40·7	20·9	19·8	1830	„ 25	37·6	18·6	19·0	1855	„ 19	36·9	21·1	15·8
1820	Jan. 1	37·3	19·9	17·4	1835	„ 25	37·6	21·3	16·3	1855	Feb. 18	38·3	21·1	17·2
1820	„ 13	36·2	18·7	17·5	1838	Jan. 9	35·8	20·9	14·9	1855	Dec. 21	38·8	20·2	18·6
1820	„ 15	36·4	14·6	21·8	1838	„ 11	36·0	21·0	15·0	1860	„ 25	37·6	20·2	17·4
1823	„ 19	36·9	13·4	23·5	1838	„ 12	36·1	16·8	19·3	1864	Jan. 6	34·0	21·1	14·9
1826	„ 14	36·3	19·5	16·8	1838	„ 13	36·2	20·9	15·3	1867	„ 4	36·4	13·2	23·2
1826	„ 15	36·4	18·4	18·0	1838	„ 15	36·4	16·2	20·2	1867	„ 14	36·3	19·3	17·0
1826	„ 16	36·5	18·9	17·6	1838	„ 18	36·7	21·3	15·4	1870	Dec. 25	37·6	20·6	17·0
1829	„ 23	37·7	21·1	16·6	1838	„ 19	36·9	17·0	19·9	1874	„ 31	37·5	21·1	16·4

Of these remarkably low mean daily temperatures there have been 48 since the year 1814, but 11 only in the last 30 years, viz., five in January, two in February, and four in December; of these 11 instances three took place in 1855, viz., in January, February, and December. During that remarkable cold period of 42 days extending from 14th January to 27th February 1855 the mean temperature was 29°·0, and, therefore, was much colder than in the recent period; the departure of these 42 days was 9¾° nearly, below their average. There was another analogous period of 42 days cold, extending from 21st December 1870 to 31st January 1871; the mean temperature of this period was 31°·1, or 6° below the average.

The mean temperature of the air on 22nd, 23rd, 29th, 30th, and 31st December descended to low points at many stations. The following table gives the lowest readings on these days.

BLE of Minimum Temperatures of the Air on the 22nd, 23rd, 29th, 30th, and 31st days of December 1874.

Names of Stations.	Minimum Temperature on the 22nd.	23rd.	29th.	30th.	31st.	Names of Stations.	Minimum Temperature on the 22nd.	23rd.	29th.	30th.	31st.	Names of Stations.	Minimum Temperature on the 22nd.	23rd.	29th.	30th.	31st.
	°	°	°	°	°		°	°	°	°	°		°	°	°	°	°
nsey -	29·5	31·0	36·5	27·5	27·0	Streatley -	17·0	19·2	25·2	18·3	15·0	Sheffield - -	27·8	20·0	24·0	14·7	15·5
ton - -	37·0	40·0	40·0	36·0	39·0	Bristol - -	25·0	22·2	26·9	23·4	13·8	Calcethorpe -	17·3	22·8	15·6	13·1	8·1
o - -	32·0	32·0	36·0	37·0	32·0	Camden Town	22·7	18·4	25·4	19·1	19·0	Hawarden -	27·0	23·0	27·0	23·0	16·5
rne - -	25·4	23·1	30·1	27·4	26·0	Chiswick -	18·5	18·5	25·5	17·5	17·0	Liverpool -	23·0	23·5	23·5	17·5	18·0
nemouth	27·0	22·1	30·7	28·6	25·1	Leicester -	19·9	19·0	12·9	16·2	10·7	Eccles - -	22·7	18·9	21·8	17·0	7·3
smouth -	22·4	17·0	27·0	22·8	20·7	Oxford - -	18·0	18·0	18·2	17·4	15·0	Moorside -	22·7	19·0	20·5	17·0	14·6
thing -	22·4	21·0	27·7	24·9	26·4	Gloucester -	21·8	21·0	27·7	11·5	12·8	Bermerside -	22·8	18·5	—	17·0	14·5
ings -	26·8	24·8	29·0	25·2	26·1	Royston - -	21·4	18·2	21·8	13·8	16·9	Hull - -	16·0	11·0	9·0	5·0	9·0
aton -	27·5	24·5	29·5	26·0	17·0	Cardington -	18·0	19·0	24·0	6·0	10·0	Stonyhurst -	13·0	15·7	16·4	13·2	14·9
bury -	19·5	20·5	26·0	21·0	18·5	Somerleyton -	24·0	22·0	11·2	10·0	14·8	Bradford -	26·9	21·0	20·0	15·2	15·0
nstaple -	28·5	24·0	31·5	30·0	26·0	Birmingham -	24·0	18·0	24·3	19·7	20·0	Leeds - -	26·0	23·0	20·0	11·0	15·0
rshot -	17·0	18·2	24·4	17·0	13·8	Norwich -	27·0	22·0	15·0	10·0	15·0	Cockermouth -	18·9	15·3	12·1	12·2	14·1
sgate -	21·5	26·0	24·5	22·3	18·4	Wolverhampn.	18·2	20·1	25·0	20·5	15·7	Allenheads -	22·5	13·0	8·5	7·5	8·0
th.Turgiss	16·8	18·8	25·0	15·0	10·2	Wisbech -	24·2	17·0	14·0	14·5	18·2	Silloth - -	17·5	11·5	13·9	11·4	11·0
ybridge -	19·0	15·0	23·3	12·8	14·0	Llandudno -	26·2	22·2	30·1	26·0	21·6	Carlisle - -	13·4	25·0	6·9	11·2	12·0
lborough -	16·7	14·3	23·5	19·5	8·8	Nottingham -	23·3	16·7	23·0	12·1	12·5	Sunderland -	28·5	24·0	15·0	11·0	21·0
enwich -	23·2	18·9	20·0	19·8	18·5	Holkham -	21·2	20·5	11·7	7·7	16·0	Bywell - -	25·0	20·0	10·0	9·0	21·0
												North Shields	24·7	19·5	12·3	6·8	22·8

From the numbers in this Table we see that great differences of temperature prevailed on every day; the lowest temperatures were 5° at Hull, 6° at Cardington, 6°·8 at North Shields on the 30th, 6°·9 at Carlisle on the 29th; but in Cornwall it was above 32°.

On 1st January 1875 the temperature descended to low points; it was 9°·8 at Leicester; 10°·5 at Norwich; 11°9 at Sheffield; 12°·0 at Nottingham; and generally less than 17° in the Midland and Northern counties.

The mean temperature **of December was 33°·2, being 5°·9 below its average, as found from 103** ***years observations;*** **6°·7 below the average of 60 years, and 7°·1 below the average of 33 Decembers.**

E. & S.—550.—2/75.

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Since the year 1771, the following are all the instances of so low a mean temperature in December as 33°·2. In the year—

1784 it was 31°·0	1799 it was 32°·8	1846 it was 32°·9
1788 „ 29°·0	1840 „ 33°·3	1874 „ 33°·2
1796 „ 30°·4	1844 „ 33°·0	

The mean temperature of November and December taken together was 37°·6; since the year 1829, when the mean temperature of these two months was 37°·1, there has been only one instance of so low a mean temperature as in this year, viz., in 1870, when it was 37°·55.

At Silloth the mean temperature of December was remarkable, being 10° below the average of 20 years. Also at Cockermouth it was remarked as being by far the coldest December observed there for 13 years.

The mean temperature of October was 6°·2 lower than in September; that of November was 9°·7 lower than in October; and December was 8°·8 lower than that of November. (From the preceding 33 years observations the mean temperature of October is lower than that of September by 7°·0; that of November is 6°·6 lower than that of October; and December 3°·5 lower than in November.)

The mean temperature of October below that of September over the whole country was 5°·6; that of November below that of October was 8°·4; and that of December below November was 9°·3. The decrease from month to month in this quarter was nearly the same at all stations.

The readings of the barometer at 159 feet above the level of the sea were alternately below and above their averages to the 16th of October, and were above their averages from the 17th to the 31st, with the exception of two days, viz., 21st and 22nd, which were 0·33 in. and 0·19 in. below. The highest reading in the month was 30·11 ins. on the 31st, and the lowest 29·09 ins. on the 5th, the range being 1·02 ins. In November the readings of the barometer were all above their averages from the 1st to the 11th, but from the 12th to the 30th they were alternately below and above for short periods. The highest reading on the 8th was 30·36 ins., and the lowest on the 29th was 28·47 ins., the range being 1·89 ins. From the 1st to the 25th of December the barometer readings were all below their averages, except on a few days, and from the 26th to the 31st of December they were above, but to very small amounts. The highest reading in the month was 30·14 ins. on the 30th, and the lowest 28·45 ins. on the 9th, the range being 1·69 ins.

At Greenwich the mean decrease of atmospheric pressure from September to October was 0·044 in.; the mean increase from October to November was 0·071 in.; and the mean decrease from November to December was 0·167 in.

The mean decrease from all stations from September to October was 0·059 in.; the mean increase from October to November was 0·106 in.; and the mean decrease from November to December was 0·144 in.

The mean temperature of the air for October was 51°·7, being respectively 2°·1 and 1°·5 higher than the averages of 103 years, and the preceding 33 years; it was 3°·9 higher than that of 1873 and 1872 respectively.

The mean temperature of November was 42°·0, being 0°·3 lower than the average of 103 years, and 1°·6 lower than that of the preceding 33 years; and 2°·2 and 3°·3 respectively lower than those recorded in the month of November in the years 1873 and 1872.

The mean temperature of December was 33°·2, being 5°·9 and 7°·1 respectively lower than the averages of 103 years, and the preceding 33 years; it was 7°·4 and 9°·7 lower than the corresponding value in 1873 and 1872.

The mean high day temperatures of the air were 0°·6 and 7°·1 lower than their respective averages in November and December, and 1°·1 higher in October.

The mean low night temperatures of the air were 0°·7 and 7°·0 lower than their respective averages in November and December, and 2°·1 higher in October.

The mean daily ranges of temperature were 1°·1 and 0°·2 lower than their respective averages in October and December, but 0°·1 higher in November.

Therefore the days and nights of November and December were cold, particularly those of December, but those of October were warm.

The fall of rain in the three months was 7·2 ins., making 20·0 ins. in the year, being 5·4 ins. below the average annual fall.

The average duration of the different directions of the wind referred to eight points of the compass, and the duration of each direction in each month in the quarter, were as follows:—

Direction of Wind.	October.			November.			December.		
	Average.	1874.	Departure from Average.	Average.	1874.	Departure from Average.	Average.	1874.	Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	2	1	−1	2	3	+1	2	3	+1
N.	3	1	−2	3½	4	+ ½	2¾	7	+4¼
N.E.	2½	2	− ½	3¼	2	−1¼	2	5	+3
E.	1½	2	+ ½	2	2	0	1½	2	+ ½
S.E.	1¼	1	− ¼	2	4	+2	1¾	2	+ ¼
S.	3½	6	+2½	3½	3	− ½	3	2	−1
S.W.	9	12	+3	7¼	6	−1¼	9½	4	−5½
W.	4¼	6	+1¾	2	5	+3	4	6	+2
Calm, nearly.	3¾	0	−3¾	3½	1	−2½	4	0	−4

The + *signs* denote excesses over averages; in the month of October the largest numbers affected with this sign are the S. and S.W., in November is the W., and in December is the N. wind.

The − *signs* denote defect below averages; in October the largest numbers with this sign are opposite N. and N.W.; in November and December is S.W.

Thus the prevailing winds in October were S. and S.W.; in November were W. and S.E.; and in December were N.

1874. Months.	Temperature of Air. Mean.	Air. Diff. from average of 103 years.	Air. Diff. from average of 33 years.	Evaporation. Mean.	Evaporation. Diff. from average of 33 years.	Dew Point. Mean.	Dew Point. Diff. from average of 33 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 33 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 33 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour. Diff. from average of 33 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
Oct. -	51·7	+2·1	+1·5	50·2	+2·0	48·7	+2·6	13·8	−1·1	54·9	0·344	+0·031	3·9	+0·3
Nov. -	42·0	−0·3	−1·6	40·3	−1·1	38·3	−1·3	11·8	+0·1	47·5	0·231	−0·0[illegible]	2·7	−0·1
Dec. -	33·2	−5·9	−7·1	32·1	−6·7	29·9	−7·1	9·3	−0·2	35·7	0·166	−0·0[illegible]	2·0	−0·6
Means -	42·3	−1·4	−2·4	40·9	−1·9	39·0	−1·9	11·6	−0·4	46·0	0·247	−0·014	2·9	−0·1

1874. Months.	Degree of Humidity. Mean.	Humidity. Diff. from average of 33 years.	Reading of Barometer. Mean.	Barometer. Diff. from average of 33 years.	Weight of a Cubic Foot of Air. Mean.	Weight. Diff. from average of 33 years.	Rain. Amount.	Rain. Diff. from average of 59 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
Oct. -	90	+3	29·708	+0·009	537	−2	3·6	+0·9	293	5	12	14	27·7	51·9
Nov. -	87	−1	29·779	+0·025	550	+2	1·9	−0·4	259	16	11	3	18·3	44·9
Dec. -	88	0	29·612	−0·194	557	+5	1·7	−0·3	285	25	6	0	12·0	32·0
Means -	88	+1	29·700	−0·053	548	+2	Sum 7·2	Sum +0·2	Mean 279	Sum 46	Sum 29	Sum 17	Lowest 12·0	Highest 51·9

NOTE.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the plus sign (+) signifies above the average.

Thunderstorms occurred, on 5 days during October; 2 days during November; and 3 days during December.

Thunder was heard, but lightning was not seen, on 7 days during the quarter at different stations.

Lightning was seen, but thunder was not heard, on 10 days in October; 3 in November; and 4 in December, mostly in the southern and midland counties.

Solar halos were seen, on 12 days during the quarter.

Lunar halos were seen, on 15 nights during the quarter, mostly in the midland and northern counties.

Auroræ boreales were seen, on the 3rd, 4th, 13th, 14th, and 18th of October generally over the country.

Snow fell, on 8 days in November, and 28 days in December all over the country.

Hail fell on 8 days in October; 9 in November; and 20 in December; mostly in the midland and northern counties.

Fog prevailed, on 61 days during the quarter, in October, mostly in the midland counties, but in November and December all over the country.

Field Elm divested of leaves, on 6th of November at Hull; the 7th at Helston and Brighton; on the 23rd at Weybridge Heath; and on the 30th at Guernsey.

Wych Elm divested of leaves, on the 25th of October at Oxford; on the 7th of November at Llandudno; and on the 14th at Hull.

Oak divested of leaves, on the 20th of November at Hull; and on the 25th at Guernsey.

Lime divested of leaves, on the 23rd of October at Guernsey and Llandudno; on the 24th at Wisbech; and on the 31st at Hull. On the 2nd of November at Strathfield Turgiss; on the 9th at Oxford; and on the 20th at Weybridge Heath.

Sycamore divested of leaves, on the 21st at Calcethorpe; on the 27th at Hull; and on the 31st at Guernsey. On the 4th of November at Weybridge Heath; and on the 6th at Llandudno.

Horsechesnut divested of leaves, on the 21st of October at Hull; on the 25th at Llandudno; on the 28th at Guernsey; and on the 29th at Oxford. On the 1st of November at Strathfield Turgiss; on the 5th at Helston; and on the 6th at Weybridge Heath.

Occidental Plane divested of leaves, on the 9th of November at Helston; and on the 17th at Hull.

Common Poplar divested of leaves, on the 5th of November at Calcethorpe; on the 6th at Llandudno; and on the 16th at Hull.

Oriental Plane divested of leaves, on the 17th of November at Hull.

Hawthorne divested of leaves, on the 7th of November at Llandudno; and on the 15th at Hull.

Hazel divested of leaves, on the 14th of November at Hull; and on the 18th at Weybridge Heath.

Walnut divested of leaves, on the 3rd of November at Hull; on the 9th at Oxford; and on the 28th at Weybridge Heath.

Swallow departed, on the 3rd of October from Guernsey; on the 5th from Calcethorpe; on the *16th from Weybridge Heath*; and on the 18th from Hull. On the 6th of November fro[illegible] *[illegible]borne.*

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING DECEMBER 31st, 1874.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S., F.M.S.	204	Oct.	29·702	1·005	63·0	45·0	18·0	59·0	50·8	8·2	54·1	49·9	·359	4·0	0·7	85	535	—	—	1·4	5	4	10	12	4·7	6·0	23	6·82
		Nov.	29·763	1·568	61·0	36·5	24·5	53·0	45·4	7·6	48·8	44·7	·297	3·2	0·5	86	542	—	—	1·5	8	7	7	8	4·3	6·1	14	3·57
		Dec.	29·587	1·316	54·5	27·0	27·5	45·2	36·3	8·9	40·9	38·2	·212	2·5	0·5	84	548	—	—	1·8	11	5	5	10	5·1	7·1	26	7·90
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	106	Oct.	29·780	0·988	68·0	32·0	36·0	61·7	45·4	16·3	53·4	48·8	·345	4·0	0·6	84	537	75·9	43·2	2·2	8	2	8	13	4·8	4·9	22	5·42
		Nov.	29·890	1·498	66·0	26·0	40·0	57·7	38·5	19·2	48·2	43·2	·279	3·2	0·7	84	545	64·0	35·4	1·9	9	6	6	9	4·9	5·5	18	4·50
		Dec.	29·754	1·228	55·0	26·0	29·0	49·2	36·7	12·5	42·3	37·0	·220	2·5	0·8	82	549	53·7	32·8	2·3	13	4	3	11	5·7	5·2	25	7·67
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	Oct.	29·830	0·980	63·0	38·0	25·0	59·0	48·0	11·0	52·8	47·4	·328	3·6	0·8	82	539	—	—	2·5	9	1	8	13	—	7·1	24	4·59
		Nov.	29·930	1·495	61·0	31·0	30·0	54·4	44·3	10·1	48·8	43·8	·286	3·3	0·5	83	545	—	—	2·2	9	6	6	9	—	7·3	22	4·43
		Dec.	29·782	1·421	54·0	26·0	28·0	46·5	35·5	11·0	41·0	35·4	·206	2·4	0·6	81	550	—	—	2·5	17	4	2	8	—	7·1	24	8·04
OSBORNE (Isle of Wight), J. R. Mann, Esq.	172	Oct.	29·699	1·056	66·9	38·2	28·7	59·5	47·8	11·7	53·0	48·6	·344	3·8	0·7	85	536	77·4	44·4	0·3	3	3	13	12	—	7·2	23	4·67
		Nov.	29·782	1·830	61·6	29·5	32·1	50·9	39·3	11·6	44·6	43·3	·280	3·2	0·1	95	547	61·5	35·9	0·3	5	8	8	9	—	7·5	15	3·32
		Dec.	29·652	1·392	53·2	23·1	30·1	40·5	30·3	10·2	35·3	33·6	·193	2·2	0·2	93	555	45·3	27·6	0·6	12	5	4	10	—	7·4	15	2·92
BOURNEMOUTH (Hants), T. A. Compton, Esq., M.D., B.A., F.M.S.	128	Oct.	29·886	1·010	63·0	37·9	25·1	57·8	49·1	8·7	53·3	49·9	·359	4·0	0·7	88	539	—	—	—	4	4	10	13	—	4·4	22	4·35
		Nov.	29·989	1·860	58·2	28·9	29·3	50·3	39·7	10·6	45·1	41·7	·263	3·0	0·5	88	550	—	—	—	10	6	4	10	—	5·3	11	2·89
		Dec.	29·806	1·310	52·8	22·0	30·8	40·7	30·6	10·1	35·7	31·9	·181	2·1	0·4	86	558	—	—	—	16	4	3	8	—	4·1	12	3·52
PORTSMOUTH, William C. Ellis, Esq.	16	Oct.	29·872	0·906	—	34·6	—	—	45·0	—	56·4	49·5	·355	4·0	1·0	78	536	93·7	42·8	1·7	5	4	10	12	0·9	7·4	24	4·91
		Nov.	29·963	1·677	—	22·0	—	—	36·5	—	47·1	41·3	·260	3·0	0·7	81	548	73·5	34·4	1·5	7	9	6	8	0·2	7·1	16	2·60
		Dec.	29·774	1·540	—	17·0	—	—	26·8	—	36·8	32·2	·183	2·1	0·5	84	556	—	25·9	1·6	16	4	3	8	1·8	6·4	16	3·65
BRIGHTON (Sussex), Frederick E. Sawyer, Esq., F.M.S.	206	Oct.	29·680	1·052	65·8	37·6	28·2	58·2	48·2	10·0	53·0	48·0	·334	3·8	0·8	83	536	92·2	44·8	0·9	5	5	11	10	—	8·0	25	3·88
		Nov.	29·751	1·858	59·0	28·6	30·4	48·8	39·2	9·6	43·8	40·0	·248	2·9	0·4	87	547	75·5	35·1	0·8	11	7	4	8	—	6·7	15	2·52
MANOR HOUSE (Hastings), Alex. E. Murray, Esq., F.M.S.	169	Oct.	29·738	0·960	63·7	39·4	24·3	56·2	48·1	8·1	52·7	47·9	·332	3·7	0·8	83	537	—	—	1·6	5	5	12	9	—	6·1	21	3·46
		Nov.	29·772	1·862	57·9	31·5	26·4	48·4	40·8	7·6	44·3	40·4	·252	2·9	0·5	86	548	—	—	1·6	10	6	6	8	—	6·7	11	1·50
		Dec.	29·605	1·588	51·7	24·8	26·9	38·2	31·9	6·3	34·8	31·4	·176	2·0	0·3	87	555	—	—	1·6	14	6	3	8	—	6·2	15	2·41
TAUNTON (Somerset), James Bottomley, Esq.	80	Oct.	29·786	0·996	65·0	32·2	32·8	62·3	45·0	17·3	52·4	47·4	·328	3·7	0·7	83	540	67·9	37·9	0·3	10	1	4	16	—	7·8	20	3·52
		Nov.	29·893	1·778	63·0	28·5	34·5	52·6	38·5	14·1	45·2	40·5	·251	2·9	0·6	84	548	57·3	33·9	0·3	9	5	6	10	—	7·2	13	2·30
		Dec.	29·744	1·550	55·1	17·0	38·1	41·4	30·6	10·8	36·6	33·7	·191	2·3	0·3	90	554	49·5	27·2	0·5	11	8	1	11	—	7·0	14	3·38
WILTON HOUSE (near Salisbury), T. Challis, Esq.	186	Oct.	29·665	1·016	68·0	29·0	39·0	60·8	42·9	17·9	51·2	47·1	·327	3·7	0·6	84	538	90·5	40·2	1·4	4	3	11	13	4·6	7·8	23	5·09
		Nov.	29·749	1·832	60·0	19·0	41·0	50·2	33·9	16·3	41·9	39·7	·246	2·9	0·3	93	550	73·0	31·7	1·4	9	7	7	7	5·0	7·4	15	2·99
		Dec.	29·584	1·372	54·0	18·5	35·5	39·7	26·6	14·1	33·2	30·4	·169	2·0	0·3	89	557	56·1	23·4	1·5	19	7	1	4	4·8	6·4	14	3·41
BARNSTAPLE (Devon), T. Mackrell, Esq.	43	Oct.	29·818	0·970	64·0	41·5	22·5	59·8	49·7	10·1	54·0	49·1	·345	3·9	0·8	83	537	—	—	1·4	4	1	14	12	—	5·3	25	4·44
		Nov.	29·919	1·640	62·0	34·0	28·0	53·5	43·4	10·1	48·0	43·4	·281	3·1	0·6	85	546	—	—	1·4	8	10	5	7	—	4·0	14	3·06
		Dec.	29·797	1·590	54·0	24·0	30·0	43·7	33·4	10·3	38·8	34·6	·201	2·3	0·5	85	554	—	—	1·3	14	4	1	12	—	4·2	22	7·10
[illegible]	[illegible]	Oct.	29·500	1·014	64·6	36·0	30·6	60·0	45·0	14·1	51·4	49·8	·358	4·0	0·3	94	534	67·8	41·4	1·7	2	3	14	12	2·1	7·0	25	4·71

Meteorological Table, Quarter ending December 31st, 1874.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean of all Highest.	Mean of all Lowest.	Daily Range.	Mean Temperature. Air.	Dew Point.	Vapour. Elastic Force.	In a Cubic foot of Air. Mean.	Short of Saturation.	Mean Degree of Humidity. Satⁿ. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Minimum on Grass.	Wind. Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
STRATHFIELD TURGISS (Hants), Rev. C. H. Griffith, M.A., F.M.S.	197	Oct.	29.672	1.020	64.3	35.0	29.3	57.9	46.8	11.1	52.0	48.0	.335	3.8	0.6	86	537	98.5	40.8	0.5	6	4	8	13	4.0	7.0	20	3.79
		Nov.	29.762	1.883	59.0	22.2	36.8	48.3	36.4	11.9	42.4	38.7	.235	2.7	0.4	87	549	73.2	32.1	0.5	6	9	7	8	3.0	7.7	13	3.16
		Dec.	29.586	1.513	53.3	10.2	43.1	38.1	27.2	10.9	33.4	30.3	.169	1.9	0.3	92	557	57.3	24.5	0.5	15	7	3	6	2.5	6.9	12	1.70
WEYBRIDGE HEATH (Surrey), William F. Harrison, Esq., F.M.S.	150	Oct.	29.756	1.040	70.0	34.0	36.0	59.6	45.1	14.5	51.5	47.5	.329	3.7	0.6	87	538	84.4	42.3	0.7	4	4	16	7	0.7	7.0	21	4.13
		Nov.	29.822	1.898	61.5	24.0	37.5	46.8	36.6	10.2	41.0	38.3	.232	2.7	0.5	90	552	60.9	32.7	0.5	8	7	9	6	0.6	6.1	15	2.62
		Dec.	29.656	1.618	52.5	12.8	39.7	36.8	27.9	8.9	32.3	28.3	.155	1.9	0.3	85	559	42.9	25.3	0.8	10	8	8	6	0.6	6.1	12	1.65
MARLBOROUGH COLLEGE (Wilts), Rev. Thomas A. Preston, M.A., F.M.S.	456	Oct.	29.397	0.994	61.7	32.8	28.9	56.9	44.8	12.1	50.7	47.4	.329	3.7	0.5	89	533	80.4	39.5	—	5	2	8	16	—	8.2	21	4.89
		Nov.	29.491	1.873	56.0	22.0	34.0	47.5	34.1	13.4	40.5	39.4	.241	2.8	0.1	96	546	64.9	30.3	—	10	4	8	8	—	7.6	19	3.52
		Dec.	29.327	1.541	53.3	8.8	44.5	37.1	25.2	11.9	31.7	29.4	.162	1.8	0.2	91	554	49.9	23.6	—	17	5	4	5	—	6.8	15	2.82
ROYAL OBSERVATORY (Kent), The Astronomer Royal.	159	Oct.	29.708	1.022	69.6	36.0	33.6	59.5	45.7	13.8	51.7	48.7	.344	3.9	0.4	90	537	88.0	39.0	0.6	2	3	13	13	—	6.9	17	3.58
		Nov.	29.779	1.889	62.6	25.0	37.6	48.4	39.6	11.8	42.0	38.3	.231	2.7	0.4	87	550	66.1	30.2	0.4	6	6	8	10	—	6.3	10	1.85
		Dec.	29.612	1.690	53.3	18.5	34.8	37.9	28.6	9.3	33.2	29.9	.166	2.0	0.2	88	557	46.5	23.7	0.5	10	6	4	11	—	7.2	12	1.69
STREATLEY VICARAGE (Berks), Rev. J. Slatter, M.A., F.R.A.S., F.M.S.	150	Oct.	29.700	0.930	67.5	32.3	35.2	59.8	45.4	14.4	52.9	47.1	.324	3.9	0.9	81	536	66.2	—	1.7	6	3	10	12	—	7.2	20	3.34
		Nov.	29.808	1.848	61.5	24.0	37.5	49.6	36.8	12.8	43.2	39.7	.262	3.0	0.4	89	549	53.6	—	1.6	6	7	8	9	—	6.9	13	3.12
		Dec.	29.632	1.638	54.6	15.0	39.6	39.7	27.7	12.0	34.2	30.6	.174	2.1	0.3	86	556	44.2	—	1.4	10	7	5	9	—	7.0	11	1.94
CAMDEN TOWN (London), G. J. Symons, Esq., F.M.S.	123	Oct.	29.766	1.065	68.1	34.8	33.3	59.5	46.6	12.9	52.5	47.5	.320	3.7	0.8	83	538	80.9	44.3	—	4	4	14	9	—	6.6	18	3.34
		Nov.	29.817	1.027	60.0	25.6	34.4	47.4	36.9	10.5	42.2	38.7	.235	2.7	0.5	88	551	57.7	34.6	—	11	2	4	13	—	6.6	15	2.21
		Dec.	29.659	1.599	53.8	18.4	35.4	38.1	28.7	9.4	33.7	30.6	.171	2.0	0.3	88	557	42.9	27.4	—	18	2	5	6	—	6.6	14	1.58
CHISWICK (Middlesex), Prof. Thiselton Dyer, M.A., B.Sc., F.L.S.	25	Oct.	29.843	0.992	67.7	29.0	38.7	59.8	44.4	15.4	52.0	47.0	.323	3.7	0.7	83	540	89.7	37.6	—	1	5	18	7	—	—	18	4.94
		Nov.	29.932	1.876	61.7	23.0	38.7	50.0	35.7	14.3	42.5	39.6	.242	2.7	0.4	90	552	61.0	30.3	—	7	6	5	12	—	—	13	1.75
		Dec.	29.750	1.544	55.0	17.0	38.0	40.1	27.8	12.3	34.4	32.9	.187	2.2	0.1	94	558	51.3	24.1	—	10	6	3	12	—	—	15	1.75
TOWN MUSEUM (Leicester), W. J. Harrison, Esq.	245	Oct.	29.577	1.134	64.6	36.3	28.3	57.5	45.7	11.8	50.9	46.4	.315	3.6	0.5	87	536	94.3	39.6	1.0	2	6	11	12	—	7.1	22	2.33
		Nov.	29.663	1.923	57.3	24.2	33.1	47.2	36.0	11.2	41.6	38.5	.234	2.7	0.3	90	548	69.5	30.8	0.5	8	5	7	10	—	7.5	16	2.22
		Dec.	29.519	1.653	50.8	10.7	40.1	36.9	26.0	10.9	32.0	27.7	.151	1.8	0.3	83	557	52.1	21.4	0.5	12	7	6	6	—	8.0	16	1.80
OXFORD (Oxfordshire), Rev. R. Main, M.A., F.R.S., F.R.A.S.	210	Oct.	29.646	1.005	63.9	34.7	29.2	58.4	46.3	12.1	52.1	47.9	.334	3.8	0.6	85	536	93.8	43.1	1.0	2	6	13	10	2.2	7.7	19	3.13
		Nov.	29.709	1.875	57.0	23.0	34.0	47.6	36.7	10.9	42.2	39.1	.239	2.8	0.3	90	549	70.5	33.9	0.7	6	7	7	10	0.6	7.9	15	2.52
		Dec.	29.573	1.599	53.0	15.0	38.0	38.2	28.0	10.2	33.0	29.7	.165	2.0	0.3	88	557	59.4	25.8	0.8	11	4	5	11	1.0	7.7	11	1.83
GLOUCESTER (Gloucester), E. Toller, Esq., M.D.	100	Oct.	29.782	1.005	63.8	37.9	25.9	59.6	47.2	12.4	52.7	49.5	.355	4.0	0.5	84	538	82.0	43.1	0.6	7	2	9	13	0.4	6.1	24	2.32
		Nov.	29.902	1.894	57.1	25.6	31.5	48.7	36.8	11.9	42.6	39.3	.241	2.7	0.4	88	551	58.7	33.9	0.4	8	5	8	9	0.0	6.7	16	2.56
		Dec.	29.754	1.642	51.5	11.9	39.6	39.2	27.1	12.1	33.6	30.8	.172	2.0	0.3	89	559	43.7	27.1	0.5	10	7	6	8	0.0	7.0	12	2.09
ROYSTON (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	Oct.	29.578	0.993	68.0	33.4	34.6	59.6	45.3	14.3	51.6	48.4	.340	3.8	0.5	89	535	—	—	—	2	2	16	11	—	6.3	14	2.18
		Nov.	29.658	1.890	59.3	19.4	39.9	48.0	34.8	13.2	41.1	37.3	.223	2.6	0.4	87	549	—	—	—	4	2	14	10	—	6.4	14	2.01
		Dec.	29.493	1.648	52.0	13.8	38.2	38.0	26.8	11.2	32.3	29.1	.161	1.9	0.2	88	556	—	—	—	10	4	5	12	—	7.2	17	1.97
CARDINGTON (near Bedford), Mr. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	100	Oct.	29.746	1.086	65.6	32.0	33.6	58.8	44.5	14.3	52.4	45.7	.308	3.6	1.0	84	538	71.9	38.8	2.1	3	4	11	13	—	7.1	17	1.70
		Nov.	29.843	1.870	57.0	23.0	34.0	47.1	34.3	12.8	40.6	37.9	.227	2.7	0.4	90	553	51.4	28.5	1.3	7	5	7	11	—	6.6	15	2.10
		Dec.	29.681	1.582	52.0	6.0	46.0	37.8	26.0	11.8	32.0	29.3	.162	1.9	0.2	89	560	38.8	20.3	1.7	11	5	4	11	—	7.4	13	1.70
ST. DAVID'S COLLEGE, LAMPETER (Cardiganshire), Prof. A. W. Scott.	420	Oct.	29.397	1.028	65.0	33.0	32.0	56.9	43.9	13.0	50.0	44.0	.288	3.4	0.8	81	534	81.6	—	—	5	5	9	12	—	—	22	5.08
		Nov.	29.510	1.824	60.0	25.0	35.0	50.4	36.8	13.6	44.1	39.5	.243	2.8	0.5	82	543	67.0	—	—	7	7	8	8	—	—	18	4.29
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	Oct.	29.809	1.028	67.0	32.1	34.9	59.6	44.9	14.7	51.9	48.3	.338	3.8	0.6	87	539	—	35.9	1.2	2	4	12	13	4.4	6.8	17	1.39
		Nov.	29.877	1.986	60.0	26.4	33.6	49.0	36.7	12.3	42.3	40.3	.250	2.8	0.2	93	551	—	26.9	0.9	8	3	9	10	4.5	6.0	18	2.60
		Dec.	29.678	1.564	51.0	10.0	41.0	37.8	26.9	10.9	32.7	32.3	.183	2.1	0.0	96	559	—	19.4	1.1	10	4	8	9	4.2	6.3	22	3.04
NORWICH (Norfolk), John Quinton, Esq., Jun.	42	Oct.	29.799	1.136	65.0	32.0	33.0	57.3	44.7	12.6	51.0	50.0	.361	4.0	0.2	96	540	—	—	—	2	4	17	8	—	—	14	1.99
		Nov.	29.880	1.954	58.8	28.5	30.3	47.1	36.5	10.6	41.9	39.3	.242	2.8	0.3	89	552	—	—	—	4	5	9	12	—	—	16	2.30
		Dec.	29.709	1.652	51.0	10.0	41.0	36.1	26.9	9.2	31.9	30.9	.173	2.0	0.1	95	560	—	—	—	9	2	5	15	—	—	20	2.15

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean. Of all Highest.	Mean. Of all Lowest.	Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat.ⁿ = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	Oct.	29·816	1·124	66·4	32·0	34·4	58·3	45·5	12·8	51·5	49·0	·347	3·9	0·7	89	540	86·7	40·6	0·7	3	2	15	11	3·2	6·8	16	1·44
		Nov.	29·921	1·872	59·2	22·8	36·4	47·0	36·2	10·8	41·0	39·2	·239	2·7	0·4	93	554	70·5	32·9	0·5	5	3	9	13	1·6	6·3	13	2·21
		Dec.	29·747	1·596	50·7	14·0	36·7	36·3	26·8	9·5	31·5	28·5	·156	1·8	0·3	87	562	54·3	23·7	0·6	10	3	5	13	2·7	6·9	15	2·03
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	10	Oct.	29·684	1·270	66·4	43·8	22·6	58·3	47·2	11·1	52·8	45·0	·300	3·4	1·0	76	537	—	—	1·1	2	3	12	14	—	7·2	21	3·42
		Nov.	29·799	1·950	67·5	34·8	32·7	52·0	41·6	10·4	46·6	40·6	·254	2·9	0·7	81	545	—	—	0·7	7	3	9	11	—	6·6	22	5·64
		Dec.	29·695	1·690	50·5	21·6	28·9	41·4	34·0	7·4	37·8	32·1	·182	3·1	0·5	81	554	—	—	0·9	6	9	7	9	—	5·7	19	4·43
DERBY (Derbyshire), John Davis, Esq.	174	Oct.	29·594	1·153	63·0	37·0	26·0	56·7	44·6	12·1	50·1	47·2	·326	3·7	0·7	90	537	—	—	—	6	3	7	15	—	—	—	1·90
		Nov.	29·735	1·890	57·0	22·0	35·0	47·0	36·3	10·7	41·2	36·9	·219	2·6	0·4	85	550	—	—	—	5	3	6	16	—	—	—	2·71
		Dec.	29·592	1·677	50·0	16·0	34·0	36·9	30·0	6·9	33·1	31·2	·176	2·1	0·1	94	557	—	—	—	13	7	3	8	—	—	—	1·90
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	183	Oct.	29·598	1·138	68·4	34·8	33·6	58·1	43·8	14·3	50·3	47·2	·326	3·7	0·4	90	537	84·7	35·9	0·5	4	3	13	11	4·1	7·8	25	1·58
		Nov.	29·727	1·922	58·1	23·7	34·4	47·5	35·5	12·0	41·1	39·0	·238	2·7	0·3	93	550	62·2	28·6	0·5	6	7	6	11	1·6	6·8	20	2·26
		Dec.	29·560	1·510	51·1	12·1	39·0	37·1	25·6	11·5	31·7	28·5	·156	1·8	3·3	86	558	46·7	19·9	0·5	14	5	3	9	1·7	6·9	19	1·54
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	Oct.	29·746	1·128	64·8	27·2	37·6	58·6	43·1	15·5	51·5	45·4	·306	3·5	0·8	80	538	77·6	36·4	1·8	5	4	16	6	—	7·6	20	2·25
		Nov.	29·864	1·488	60·7	22·0	38·7	50·8	34·4	16·4	42·8	38·5	·233	2·6	0·5	85	551	57·6	27·5	1·3	6	3	11	10	—	7·9	16	2·52
		Dec.	29·612	1·612	50·2	7·7	42·5	38·4	24·1	14·3	32·6	29·0	·160	1·9	0·2	86	558	42·1	21·4	1·4	9	2	7	13	—	8·0	19	3·10
CALCETHORPE MANOR (near) Louth (Lincolnshire), D. Grant Briggs, Esq., F.M.S.	382	Oct.	29·384	1·213	63·0	32·0	31·0	55·7	43·4	12·3	48·7	45·8	·309	3·5	0·4	90	535	90·7	37·2	1·6	4	3	14	10	6·3	7·0	22	1·72
		Nov.	29·493	1·932	56·3	24·8	31·5	45·7	35·5	10·2	39·9	36·9	·220	2·6	0·3	90	547	76·8	31·3	1·0	6	3	11	10	6·4	6·5	21	3·23
		Dec.	29·341	1·624	46·3	8·0	38·3	35·2	25·3	9·9	30·2	27·8	·152	1·8	0·3	90	555	66·0	22·3	1·2	9	4	7	11	4·9	6·8	24	2·89
HAWARDEN (Flint), T. Moffat, Esq., M.D., F.R.A.S.	270	Oct.	29·513	1·246	61·5	41·0	20·5	55·2	47·9	8·3	50·2	46·9	·320	3·6	0·5	89	536	75·3	29·5	2·2	6	1	10	14	1·0	7·1	24	3·04
		Nov.	29·642	1·900	60·5	27·0	33·5	46·9	39·2	7·7	42·8	39·7	·244	2·8	0·4	88	546	54·0	22·9	2·2	5	4	10	11	0·8	7·3	21	3·08
		Dec.	29·524	1·730	49·0	16·5	32·5	38·0	30·5	7·5	35·5	33·2	·191	2·2	0·3	91	553	39·2	14·2	1·7	12	3	6	10	0·6	6·4	15	3·51
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	July	29·747	0·717	82·3	50·0	32·3	69·4	55·4	14·0	61·1	49·7	·357	4·0	2·0	67	528	—	—	1·1	2	4	9	16	—	5·7	15	2·84
		Aug.	29·653	1·203	75·1	49·7	25·4	65·7	53·7	12·0	58·2	50·2	·365	4·1	1·4	75	530	—	—	1·5	2	5	9	15	—	6·6	18	2·47
		Sept.	29·593	0·904	73·0	43·6	29·4	62·1	51·6	10·5	55·6	48·6	·344	3·8	1·1	78	531	—	—	1·2	3	4	13	10	—	6·5	19	2·38
		Oct.	29·571	1·249	62·8	42·0	20·8	56·1	46·4	9·7	50·5	45·0	·300	3·4	0·7	79	537	—	—	1·5	3	5	12	11	—	7·1	26	3·86
		Nov.	29·695	1·930	59·9	27·6	32·3	48·1	39·2	8·9	43·6	38·6	·234	2·7	0·5	83	547	—	—	1·5	4	9	9	8	—	6·3	17	3·53
		Dec.	29·572	1·700	51·9	17·5	34·4	39·0	30·0	9·0	34·4	30·6	·171	2·1	0·3	85	555	—	—	1·2	10	7	6	8	—	6·5	15	2·42
ECCLES (near Manchester), T. Mackereth, Esq., F.R.A.S., F.M.S.	145	Oct.	29·644	1·264	66·0	34·0	32·0	56·7	43·9	12·8	50·0	45·0	·299	3·4	0·7	84	538	63·6	37·1	0·6	4	4	13	10	2·7	7·5	25	4·09
		Nov.	29·757	1·912	60·2	25·8	34·4	48·2	36·5	11·7	42·2	38·2	·231	2·7	0·5	86	549	51·2	29·5	0·4	9	5	6	10	1·9	7·6	19	5·11
		Dec.	29·636	1·624	49·5	7·3	42·2	37·1	25·1	12·0	31·6	27·3	·149	1·7	0·4	84	560	37·4	19·1	0·4	11	11	6	3	1·6	7·2	13	3·17
MOOR SIDE OBSERVATORY, HALIFAX (Yorkshire), Louis J. Crossley, Esq., F.R.A.S.	429	Oct.	29·291	1·268	64·0	34·7	29·3	55·1	44·2	10·9	48·6	43·3	·281	3·2	0·7	83	534	81·8	38·0	1·0	5	5	8	13	2·7	7·6	23	4·72
		Nov.	29·418	1·905	57·1	24·2	32·9	46·6	36·5	10·1	41·0	36·2	·213	2·5	0·5	83	545	58·9	31·6	0·8	7	6	5	12	0·1	6·8	13	3·46
		Dec.	29·288	1·668	49·0	14·6	34·4	36·1	27·1	9·0	31·5	26·4	·143	1·6	0·5	82	553	47·7	20·9	0·6	11	5	5	10	1·0	6·5	15	2·77
BERMERSIDE OBSERVATORY, HALIFAX (Yorkshire), Edward Crossley, Esq., F.R.A.S.	520	Oct.	29·281	1·254	65·6	34·0	31·6	54·4	43·3	11·1	48·2	45·8	·308	3·5	0·3	92	534	86·9	39·5	0·9	8	5	10	13	—	7·4	25	4·78
		Nov.	29·354	1·884	57·0	23·4	33·6	45·1	36·1	9·0	40·1	36·1	·212	2·5	0·4	86	544	66·8	32·5	0·5	5	7	7	11	—	6·2	13	3·74
		Dec.	29·173	1·694	47·0	14·5	32·5	35·8	27·2	8·6	31·5	29·8	·161	1·9	0·1	94	551	58·8	25·0	0·6	7	6	7	11	—	5·5	10	3·06
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	Oct.	29·783	1·312	64·0	32·0	32·0	56·4	44·1	12·3	50·0	45·5	·304	3·5	0·6	85	541	73·8	42·0	—	—	—	—	—	2·3	—	19	2·02
		Nov.	29·888	1·946	57·0	21·0	36·0	46·0	35·0	11·0	41·0	36·0	·212	2·4	0·6	83	553	57·3	32·9	—	—	—	—	—	2·7	—	18	3·50
		Dec.	29·758	1·710	46·0	5·0	41·0	35·6	24·3	11·3	30·0	—	—	—	—	—	—	44·1	21·5	—	—	—	—	—	2·0	—	22	2·50
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	363	Oct.	29·356	1·383	63·0	31·8	31·2	56·2	43·5	12·7	49·2	44·2	·291	3·3	0·8	84	534	94·1	39·2	—	2	3	11	15	—	7·8	25	6·90
		Nov.	29·493	1·859	60·0	27·9	32·1	47·4	36·9	10·5	41·8	37·7	·227	2·6	0·5	86	545	75·8	32·7	—	3	6	4	17	—	7·5	24	5·35
		Dec.	29·372	1·639	49·0	13·0	36·0	36·6	24·9	11·7	31·0	26·2	·143	1·7	0·4	81	555	60·9	20·2	—	14	6	5	6	—	5·9	19	3·95
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	Oct.	29·383	1·308	62·0	38·0	24·0	56·2	45·5	10·7	49·6	46·3	·314	3·6	0·5	89	534	68·5	—	1·0	5	4	8	14	—	6·5	19	2·83
		Nov.	29·518*	1·446	56·8	26·0	30·8	47·0	37·7	9·3	42·0	38·0	·229	2·6	0·5	86	545	58·4	—	0·8	4	5	8	13	—	6·8	12	2·74
		Dec.	29·386	1·672	49·8	15·0	34·8	36·8	27·6	9·0	32·3	29·0	·160	1·9	0·3	87	554	40·7	—	1·0	12	4	4	11	—	7·3	11	2·64

NAMES of STATIONS and OBSERVERS.	Height of Station above Sea Level.	Year 1874. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
LEEDS PHILOSOPHICAL HALL (Yorkshire), LOUIS C. MIALL, Esq.	137	Oct.	29·624	1·291	64·0	37·0	27·0	56·4	44·5	11·9	50·5	47·0	·322	3·6	0·6	89	537	66·0	—	1·1	7	2	6	16	—	7·4	23	2·17
		Nov.	29·779	1·915	60·0	25·0	35·0	46·8	36·5	10·3	42·1	37·4	·224	2·6	0·5	84	550	54·6	—	1·0	7	2	7	14	—	7·3	17	2·67
		Dec.	29·611	1·676	49·0	11·0	38·0	35·5	28·0	7·5	32·8	28·2	·154	2·0	0·3	84	558	45·7	—	1·0	13	3	3	12	—	7·0	20	2·64
COCKERMOUTH (Cumberland), H. DODGSON, Esq., M.D., F.R.A.S., F.M.S.	146	Oct.	29·573	1·478	64·7	31·9	32·8	55·3	44·5	10·8	49·7	44·1	·290	3·3	0·7	82	537	73·2	33·5	0·8	5	5	9	12	9·6	7·1	24	8·80
		Nov.	29·711	1·782	55·2	27·8	27·4	47·7	39·0	8·7	45·0	39·7	·245	2·8	0·4	88	548	56·6	31·3	0·4	9	6	7	8	1·4	7·2	18	4·54
		Dec.	29·621	1·084	49·0	12·1	36·9	36·2	24·9	11·3	30·3	27·1	·152	1·8	0·2	87	561	38·8	20·1	0·4	12	11	5	3	1·7	4·6	13	2·57
ALLENHEADS (Northumberland), MR. T. KIDD, Assistant to W. B. BEAUMONT, Esq., M.P.	1360	Oct.	28·298	1·418	58·5	30·5	28·0	50·5	38·4	12·1	43·6	41·4	·262	3·0	0·4	92	521	74·8	35·9	1·8	3	6	10	12	—	7·0	23	5·72
		Nov.	28·425	1·464	55·5	24·0	31·5	44·3	32·8	11·5	37·6	35·0	·205	2·4	0·4	91	530	64·9	30·8	1·3	7	3	7	13	—	5·8	18	4·52
		Dec.	28·285	1·605	42·5	7·5	35·0	35·5	20·5	15·0	27·0	26·4	·144	1·7	0·1	97	539	57·6	21·9	1·0	9	5	7	10	—	6·4	23	6·76
SILLOTH RECTORY (Cumberland), REV. FRANCIS REDFORD, M.A., F.R.A.S., F.M.S.	28	Oct.	29·692	1·551	64·0	31·4	32·6	56·8	43·8	13·0	49·5	44·5	·294	3·4	0·7	84	540	79·9	40·8	1·6	5	3	8	15	10·6	6·4	21	6·51
		Nov.	29·833	1·952	56·9	29·3	27·6	48·2	38·9	9·3	42·8	39·5	·243	2·8	0·4	88	550	64·8	35·2	1·1	6	9	3	12	9·5	6·7	18	3·43
		Dec.	29·753	1·776	48·8	10·5	38·3	35·8	25·8	10·0	30·4	25·0	·134	1·8	0·4	78	563	50·3	23·1	1·0	11	13	1	6	8·7	5·2	13	2·47
CARLISLE (Cumberland), J. CARTMELL, Esq., F.M.S.	114	Oct.	29·610	1·519	64·0	29·7	34·3	55·5	41·7	13·8	48·2	43·6	·283	3·3	0·6	85	540	73·3	36·4	2·8	2	4	10	15	6·7	6·4	22	5·12
		Nov.	29·760	1·799	57·5	25·9	31·6	46·8	36·9	9·9	41·5	38·3	·232	2·7	0·3	89	550	55·2	31·3	1·8	4	8	7	11	6·0	7·3	19	3·65
		Dec.	29·664	1·753	49·5	6·9	42·6	35·5	23·4	12·1	29·8	24·4	·137	1·6	0·2	80	562	39·6	18·0	1·2	10	8	6	7	4·3	6·4	8	2·11
BYWELL (Northumberland), MR. JOHN DAWSON, Assistant to W. B. BEAUMONT, Esq., M.P.	87	Oct.	29·590	1·506	64·0	35·0	29·0	57·6	45·4	12·2	50·4	42·6	·275	3·1	0·9	76	537	70·8	37·9	1·6	4	3	7	17	—	5·0	24	2·18
		Nov.	29·750	1·846	64·0	28·0	36·0	48·4	38·3	10·1	42·5	36·0	·216	2·5	0·6	79	549	57·5	30·5	1·3	6	7	5	12	—	6·2	19	4·28
		Dec.	29·637	1·644	46·0	9·0	37·0	36·1	27·0	9·1	31·8	27·2	·148	1·8	0·4	81	559	39·9	20·1	1·4	5	4	7	15	—	6·6	23	5·06
NORTH SHIELDS (Northumberland), ROBERT SPENCE, Esq.	124	Oct.	29·619	1·543	61·8	34·5	27·3	54·8	43·1	11·7	48·0	42·1	·267	3·1	0·7	80	540	—	40·6	1·9	7	3	7	14	—	6·6	16	1·66
		Nov.	29·780	1·743	59·0	28·0	31·0	46·3	37·2	9·1	41·2	36·3	·213	2·5	0·5	83	551	—	35·0	1·4	10	5	3	12	—	6·8	24	3·30
		Dec.	29·666	1·679	50·0	6·8	43·2	37·2	27·3	9·9	32·0	28·0	·153	1·8	0·3	84	560	—	25·8	1·5	13	4	3	11	—	7·0	24	3·79
MILTOWN (Banbridge, Ireland), JOHN SMYTH, Esq., jun., M.A., M.I.C.E.I.	200	Oct.	29·390	1·340	59·0	30·0	29·0	54·2	41·4	12·8	47·0	42·3	·270	3·1	0·7	81	536	83·4	36·0	2·0	4	3	16	8	—	5·8	18	3·62
		Nov.	29·559	1·586	57·0	30·0	27·0	49·2	39·3	9·9	44·2	40·9	·256	2·9	0·4	89	543	59·4	35·7	1·5	3	6	11	10	—	5·9	22	3·25
		Dec.	29·480	1·768	50·0	18·0	32·0	39·6	28·6	11·0	34·0	30·1	·168	2·0	0·3	85	554	47·5	24·4	0·8	8	6	6	11	—	5·2	20	3·04

NOTE.—*The Barometer Reading*, BARNSTAPLE, 2nd October, 9h. a.m., 30·400 in., has been altered to 29·400 in.
„ TAUNTON, 28th „ 9h. a.m., 29·074 in., „ 30·074 in.
„ STRATHFIELD TURGISS, 30th November, 9h. a.m., 29·797 in., „ 28·797 in.
„ BARNSTAPLE, 11th December, 9h. a.m., 29·880 in., „ 28·880 in.
„ LEEDS, 11th „ 4h. p.m., 29·505 in., „ 28·505 in.

NOTE.—DERBY, October, November, and December. No readings of instruments are given, only sums and means, and therefore their accuracy cannot be tested.

Second Rain-gauges are placed—

			October.		November.		December.		Total during the Quarter.
At Portsmouth,	at the height of	20 feet *above the ground*, the amount collected was	4·66 inches.	-	2·48 inches.	-	3·80 inches.	-	10·88 inches.
„ Strathfield Turgiss,	„	38 feet „ „	2·45 „	-	2·10 „	-	1·11 „	-	5·66 „
„ Eccles (Manchester),	„	34 feet „ „	3·26 „	-	4·25 „	-	2·31 „	-	9·82 „
„ Carlisle,	„	3 feet „ „	1·46 „	-	1·02 „	-	0·14 „	-	2·62 „
„ Miltown (Ireland),	„	40 feet „ „	3·20 „	-	2·65 „	-	2·52 „	-	8·37 „
„ Oxford,	„	22 feet „ „	3·06 „	-	2·37 „	-	1·80 „	-	7·28 „
„ Marlborough College,	„	8 inches „ „	4·71 „	-	3·37 „	-	2·83 „	-	10·91 „
„ „	„	1 foot „ „	4·66 „	-	3·30 „	-	2·72 „	-	10·68 „
„ Cardington,	„	36 feet „ „	1·50 „	-	1·80 „	-	1·40 „	-	4·70 „
„ Nottingham,	„	39 feet „ „	1·36 „	-	1·75 „	-	1·54 „	-	4·65 „
„ Wisbech,	„	8 feet „ „	1·35 „	-	2·15 „	-	1·87 „	-	5·37 „
„ Aldershot Camp,	„	25 feet „ „	2·79 „	-	1·82 „	-	2·10 „	-	7·71 „

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind: Mean Estimated Strength.	Wind: Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain: Number of Days on which it fell.	Rain: Amount collected.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
Guernsey	29·817	63·0	27·0	36·0	52·4	44·2	23·3	8·2	47·9	43·6	·289	3·2	0·6	85	542	—	—	1·6	8	5	7	10	4·7	6·4	63	18·29
Helston	29·644	64·0	26·0	42·0	56·2	40·2	35·0	16·0	48·0	43·0	·281	3·2	0·7	83	544	64·5	37·1	2·1	10	4	6	11	5·1	5·2	63	17·59
Truro	29·621	63·0	26·0	37·0	53·3	42·6	27·7	10·7	47·5	42·2	·273	3·1	0·6	82	545	—	—	2·4	12	4	5	10	—	7·2	70	17·06
Osborne	29·628	66·9	23·1	43·8	50·3	39·1	30·3	11·2	44·3	41·8	·272	3·1	0·3	91	546	61·4	36·0	0·4	7	5	8	10	—	7·4	53	[illegible]
Bournemouth		63·0	22·0	41·0	49·6	39·8	28·4	9·8	44·7	41·2	·268	3·0	0·5	87	549	—	—	—	10	5	6	10	—	4·6	45	[illegible]
Portsmouth	29·621	—	17·0	—	—	36·1		—	46·8	41·0	·266	3·0	0·7	81	547	—	34·4	1·6	9	6	6	9	1·0	7·0	56	[illegible]
Hastings	29·638	63·7	24·8	38·9	47·6	40·3	25·9	7·3	43·9	39·9	·253	2·9	0·5	85	547	—	—	1·6	10	6	7	8	—	6·3	47	[illegible]
Taunton	29·640	65·0	17·0	48·0	52·1	38·0	35·1	11·1	44·7	40·5	·257	3·0	0·5	86	547	58·2	33·0	0·4	10	5	4	12	—	7·3	47	[illegible]
Salisbury	29·624	68·0	18·5	49·5	50·2	34·1	38·5	16·1	42·1	39·1	·247	2·9	0·4	89	518	73·2	31·8	1·4	11	6	6	8	4·8	7·2	51	[illegible]
Barnstaple	29·616	64·0	24·0	40·0	52·3	42·2	26·8	10·1	46·9	42·4	·276	3·1	0·6	84	546	—	—	1·4	9	5	7	10	—	4·5	61	[illegible]
Aldershot Camp	29·590	66·6	13·8	52·8	49·1	35·0	37·7	13·1	41·7	39·8	·255	2·9	0·3	93	545	64·5	31·9	1·6	6	4	8	12	1·9	7·2	50	[illegible]
Ramsgate	29·629	66·6	18·4	48·2	49·8	39·0	33·1	10·8	44·4	39·7	·252	2·9	0·6	83	547	79·8	36·4	1·3	7	7	9	7	—	6·2	45	[illegible]
Strathfield Turgiss	29·645	61·3	10·2	54·1	48·1	36·8	36·4	11·3	42·0	39·0	·246	2·8	0·4	88	548	76·3	32·5	0·5	9	7	6	9	3·2	7·2	45	[illegible]
Weybridge Heath	29·675	70·0	12·8	57·2	47·7	36·5	37·7	11·2	41·6	38·0	·230	2·8	0·5	87	550	62·7	33·4	0·7	7	6	11	6	0·6	6·4	48	[illegible]
Marlborough College	29·606	61·7	8·8	52·9	47·2	34·7	35·8	12·5	41·0	38·7	·244	2·8	0·3	92	544	65·1	31·1	—	10	4	7	10	—	7·5	55	[illegible]
Royal Observatory	29·631	69·6	18·5	51·1	48·6	37·0	35·3	11·6	42·3	39·0	·247	2·9	0·5	88	548	66·9	31·0	0·5	6	5	8	11	—	6·8	39	[illegible]
Streatley Vicarage	29·630	67·3	15·0	52·5	49·7	36·6	37·4	13·1	43·4	39·1	·251	3·0	0·5	85	547	54·7	—	1·6	7	6	8	10	—	7·0	44	[illegible]
Camden Town	29·638	68·1	18·4	49·7	48·3	37·4	34·4	10·9	42·8	38·9	·245	2·8	0·5	86	549	60·5	35·1	—	11	3	8	9	—	6·6	47	[illegible]
Chiswick	29·619	67·7	17·0	50·7	50·0	36·0	38·5	14·0	43·0	39·8	·251	2·9	0·4	89	550	67·3	34·0	—	6	6	9	10	—	—	46	[illegible]
Leicester	29·625	64·6	10·7	53·9	47·2	35·9	33·8	11·3	41·5	37·5	·243	2·7	0·4	87	547	72·0	30·6	0·7	7	6	8	9	—	7·5	54	[illegible]
Oxford	29·627	63·9	15·0	48·9	48·1	37·0	33·7	11·1	42·4	38·0	·246	2·9	0·4	88	547	74·6	34·3	0·8	6	6	8	10	1·3	7·8	45	[illegible]
Gloucester	29·667	63·8	11·9	51·9	49·2	37·0	32·3	12·2	43·0	39·9	·256	2·9	0·4	87	549	61·3	34·7	0·5	8	5	8	10	0·1	6·6	52	[illegible]
Royston	29·632	68·0	13·8	54·2	48·5	35·6	37·6	12·9	41·7	38·3	·241	2·8	0·4	88	547	—	—	—	5	3	12	11	—	6·6	45	[illegible]
Cardington	29·636	65·6	6·0	59·6	47·9	34·9	37·9	13·0	41·7	37·6	·232	2·7	0·5	88	550	54·0	29·2	1·7	7	5	7	12	—	7·0	45	5·50
Somerleyton Rectory	29·587	67·0	10·0	57·0	48·8	36·2	36·5	12·6	42·3	40·3	·257	2·9	0·3	92	550	—	27·4	1·1	6	4	10	11	4·4	6·4	57	[illegible]
Norwich	29·583	65·0	10·0	55·0	46·8	34·0	34·8	10·8	41·6	40·1	·250	2·9	0·2	93	551	—	—	—	5	4	10	12	—	—	50	[illegible]
Wisbech	29·596	63·4	11·0	52·4	47·2	36·2	35·8	11·0	41·3	38·9	·247	2·8	0·5	90	552	70·5	32·4	0·6	6	3	10	12	2·5	6·7	44	5·68
Llandudno	29·591	67·5	21·6	45·9	50·6	40·9	28·1	9·7	45·6	39·2	·245	2·8	0·7	79	545	—	—	0·9	5	5	9	11	—	6·5	62	[illegible]
Derby	29·590	63·0	16·0	47·0	46·9	37·0	31·7	9·9	41·5	38·4	·240	2·8	0·4	90	548	—	—	—	8	4	5	13	—	—	—	[illegible]
Nottingham	29·590	68·4	12·1	56·3	47·6	35·0	35·7	12·6	41·0	38·2	·240	2·7	0·3	90	548	64·5	28·1	0·5	8	5	7	10	2·5	7·2	64	5·38
Calecthorpe	29·601	63·0	8·0	55·0	45·5	34·7	33·6	10·8	39·6	36·8	·227	2·6	0·3	90	546	77·8	30·3	1·5	6	3	11	10	5·9	6·8	67	[illegible]
Hawarden	29·606	61·5	16·5	45·0	46·7	38·9	28·8	7·8	42·2	39·9	·252	2·9	0·4	89	545	56·2	22·2	2·0	8	3	9	11	9·8	6·9	60	[illegible]
Liverpool	29·595	62·8	17·5	45·3	47·7	38·5	29·2	9·2	42·8	38·1	·235	2·7	0·5	82	546	—	—	1·4	6	7	9	9	—	7·0	56	[illegible]
Eccles	29·613	66·0	7·3	58·7	47·3	35·2	36·2	12·1	41·3	36·8	·226	2·6	0·5	85	549	50·7	28·6	0·5	8	7	8	8	2·1	7·4	57	[illegible]
Moorside, Halifax	29·595	64·0	14·6	49·1	45·9	35·9	32·2	10·0	40·4	35·3	·212	2·4	0·6	85	544	62·8	30·2	0·8	8	5	6	12	1·8	7·0	51	[illegible]
Bermerside „	29·622	65·6	14·5	51·1	45·1	35·5	32·6	9·6	39·9	37·2	·227	2·6	0·3	91	543	70·8	32·3	0·7	5	6	8	12	—	6·4	48	[illegible]
Hull	29·601	64·0	5·0	59·0	46·0	34·5	36·3	11·5	40·3	—	—	—	—	—	—	65·1	32·1	—	—	—	—	—	2·3	—	59	[illegible]
Stonyhurst	29·587	64·0	13·0	50·0	46·7	35·1	33·1	11·6	40·7	36·0	·220	2·5	0·6	81	545	78·3	30·7	—	6	5	7	13	—	7·1	68	[illegible]
Bradford	29·598	62·0	15·0	47·0	46·7	37·0	29·9	9·7	41·3	37·8	·234	2·7	0·4	87	544	55·2	—	0·9	7	4	7	13	—	6·9	42	[illegible]
Leeds	29·598	64·0	11·0	53·0	46·2	36·3	33·3	9·9	41·8	37·5	·233	2·7	0·5	86	548	51·8	—	1·0	9	2	5	14	—	7·2	60	[illegible]
Cockermouth	29·569	64·7	12·1	52·6	46·4	36·1	32·4	10·3	41·0	37·0	·229	2·6	0·4	86	549	56·2	28·3	0·5	9	7	7	8	1·9	6·3	55	[illegible]
Allenheads	29·597	58·5	7·5	51·0	43·4	30·6	31·5	12·8	36·1	34·3	·204	2·4	0·3	93	530	65·8	29·5	1·4	6	5	8	12	—	6·4	64	[illegible]
Silloth	29·566	64·0	10·5	53·5	46·9	36·2	32·8	10·7	40·9	36·3	·224	2·7	0·5	83	551	65·0	33·0	1·2	7	8	4	11	9·6	6·1	52	[illegible]
Carlisle	29·587	64·0	6·9	57·1	45·9	34·0	36·2	11·9	39·8	35·4	·217	2·5	0·4	85	551	56·0	28·6	1·9	5	7	8	11	5·7	6·7	49	[illegible]
Bywell	29·542	64·6	9·0	55·0	47·4	36·9	34·0	10·5	41·6	35·3	·213	2·5	0·6	79	548	56·1	29·5	1·4	5	5	6	15	—	5·9	66	[illegible]
North Shields	—	61·8	6·8	55·0	46·1	35·9	33·8	10·2	40·4	35·5	·211	2·5	0·5	82	550	—	33·8	1·6	10	4	4	12	—	6·8	64	[illegible]
Miltown (Ireland)	—	59·0	18·0	41·0	47·7	36·4	29·3	11·3	42·0	37·8	·231	2·7	0·5	85	544	63·4	32·0	1·4	5	5	11	10	—	5·6	60	[illegible]

The highest temperatures of the air were at Weybridge, 70°·0 and the Royal Observatory, 69°·6.

The lowest temperatures of the air were at Hull, 5°·0; Cardington, 6°·0; and North Shields, 6°·8.

The greatest daily ranges of the temperatures of the air were at Salisbury, 16°·1; and Helston, 16°·0.

The least daily ranges of the temperatures of the air were at Hastings, 7°·3; and Hawarden, 7°·8.

The greatest numbers of rainy days were at Truro, 70; Stonyhurst, 68; and Calecthorpe, 67.

The least numbers of rainy days were at the Royal Observatory, 39; and Bradford, 42.

The heaviest falls of rain were at Guernsey, 18·29 inches; Helston, 17·59 inches; and Truro, 17·06 inches.

The least falls of rain were at Nottingham, 5·38 inches; Cardington, 5·50 inches; and Wisbech, 5·68 inches.

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind: Mean Estimated Strength.	Wind: Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain: Mean Number of Days it fell.	Rain: Mean Amount collected.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									
Guernsey	29·817	63·0	27·0	36·0	52·4	44·2	23·3	8·2	47·9	43·6	·289	3·2	0·6	85	542	—	—	1·6	8	5	7	10	4·7	6·4	63	[illegible]
Between the latitudes 50° and 51°	29·630	65·4	25·0	40·4	51·8	40·5	29·7	11·3	46·1	41·6	·269	3·1	0·6	84	546	65·0	35·8	1·6	11	5	6	9	3·0	6·5	56	[illegible]
Between the latitudes 51° and 52°	29·635	66·1	15·1	51·0	49·1	36·8	35·1	12·3	42·6	39·3	·250	2·9	0·1	88	548	66·0	32·8	1·0	8	5	8	10	2·0	6·8	49	[illegible]
Between the latitudes 52° and 53°	29·601	66·4	13·0	53·4	48·1	36·5	34·8	11·6	42·1	38·9	·245	2·8	0·1	89	549	63·0	29·3	0·9	6	4	9	12	3·1	6·7	52	[illegible]
Between the latitudes 53° and 54°	29·602	63·6	12·2	51·4	46·4	36·2	32·5	10·2	41·0	37·3	·230	2·6	0·5	86	546	63·5	29·6	1·1	7	5	8	11	2·5	7·0	57	[illegible]
Between the latitudes 54° and 55°	29·572	63·0	9·2	53·8	46·0	34·8	33·4	11·2	39·9	35·7	·217	2·6	0·4	85	546	59·8	29·8	1·3	6	6	7	12	5·7	6·3	57	[illegible]
North Shields	—	61·8	6·8	55·0	46·1	35·9	33·8	10·2	40·4	35·5	·211	2·5	0·5	82	550	—	33·8	1·6	10	4	4	12	—	6·8	64	[illegible]
Miltown, Banbridge (Ireland)	—	59·0	18·0	41·0	47·7	36·4	29·3	11·3	42·0	37·8	·231	2·7	0·5	85	544	63·4	32·0	1·4	5	5	11	10	—	5·6	60	[illegible]
Mean for the Quarter, 50° to 55°: Year 187	29·762	65·0	19·1	45·9	48·5	36·7	31·6	11·8	42·3	38·4	·238	2·7	0·3	87	550	68·1	31·2	0·9	6	6	8	10	3·1	6·2	46	[illegible]
„ 1872	29·398	63·5	25·6	37·9	50·3	39·6	30·6	10·7	44·7	41·1	·260	3·0	0·4	88	540	64·7	34·1	1·2	5	5	10	10	3·6	6·7	67	[illegible]
„ 1873	29·714	68·8	22·8	46·0	50·5	30·1	34·0	11·4	44·6	40·8	·256	2·9	0·5	87	546	66·1	33·5	1·0	5	5	8	12	3·2	6·6	45	[illegible]
„ 1874	29·608	64·9	14·9	50·0	48·3	37·0	33·1	11·3	42·4	38·6	·242	2·8	0·5	86	547	63·1	31·5	1·2	7	5	8	11	3·3	6·7	55	[illegible]

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING MARCH 31, 1875.

REMARKS ON THE WEATHER DURING THE QUARTER ENDING MARCH 31ST, 1875.

By JAMES GLAISHER, ESQ., F.R.S., *&c.*

The severe cold period which set in on 21st November 1874, continued to the 1st January 1875, this was followed by a very unusually warm period, beginning on the 2nd day of January and ending on the 30th; the mean daily temperature of these 29 days was 6°¾ in excess over the average of 60 years. On several days the excess over the average was as large as 10°, 11°, and 12°, and during this period the direction of the wind was mostly S.W., or S.S.W., or W.S.W. On the only day within the period, on January 22nd, that the wind was from N.E. and N.W., the mean temperature was 2°¼ below its average. On the last day of January a cold period again set in and continued very nearly to the end of the quarter; the direction of the wind was almost continuously East or a compound of the East till March 24th; the average daily deficiency of temperature for the 54 days ending March 24th was more than 3° daily; on a few days within this period when the direction of the wind was W. or a compound of the west, the temperature was somewhat in excess of the average. From 25th March to the end of the quarter the wind was mostly from a compound of west and the daily temperature was in excess of the average to the amount of 3°¼ daily. Taking into account the very severe weather from 21st November to 1st January, and from 31st January to the end of the quarter, with the long continuance of east wind, this winter has been one of most unusual severity.

The mean temperature of January was 10°·2 higher than in December, that of February was 8°·4 lower than in January; and that of March was 5°·2 higher than in February. (From the preceding 34 years observations the mean temperature of January is lower than that of December by 1°·9; that of February is 0°·9 higher than in January; and March 2°·4 higher than in February).

The mean temperature of January above that of December over the whole country was 9°·8; that of February below that of January was 7°·2; and that of March above that of February was 4°·5.

The mean temperature of the air for January was 43°·4, being respectively 7°·0 and 5°·0 higher than the averages of the preceding 104 years and 34 years; it was 1°·7 and 1°·3 higher than the values in 1874 and 1873 respectively.

Since the year 1771 there have been three Januaries only of higher temperature than 43°·4, viz., in the year 1796 when it was 45°·3; in the year 1834 when it was 44°·4, and in the year 1846 when it was 43°·7, exceeding the value this year by 1°·9 in 1796; by 1°·0 in 1834, and 0°·3 in 1846.

The mean temperature of February was 35°·0, being 3°·6 and 4°·3 lower than the averages of the preceding 104 years and 34 years; it was 3°·7 lower than in 1874, and 0°·7 higher than in 1873.

The temperature of February was low, but since 1771 there have been 17 Februaries of still lower temperature, viz.: In the year—

1771	it was 1°·6 lower	1795	it was 0°·9 lower	1845	it was 2°·3 lower
1772	„ 0°·8 „	1800	„ 0°·9 „	1853	„ 1°·7 „
1773	„ 0°·1 „	1814	„ 1°·0 „	1855	„ 5°·6 „
1782	„ 0°·6 „	1827	„ 3°·4 „	1858	„ 0°·4 „
1784	„ 3°·1 „	1830	„ 0°·8 „	1873	„ 0°·7 „
1785	„ 4°·6 „	1838	„ 2°·1 „		

The mean temperature of March was 40°·2, being 0°·9 lower than the average of the preceding 104 years, and 1°·5 lower than the average of the preceding 34 years; it was 3°·5 and 1°·7 lower than the values in 1874 and 1873 respectively.

The mean high day temperatures of the air were 5°·1 and 2°·9 lower than their respective averages in February and March, and 4°·4 higher in January.

The mean low night temperatures of the air were 5°·9 and 0°·8 higher than their respective averages in January and March, and 2°·3 lower in February.

The mean daily ranges of temperature were all small, and were 1°·4, 2°·7, and 3°·6 lower than their respective averages in January, February, and March.

Therefore the days and nights of February and March were cold, and in January were warm.

The readings of the barometer at 160 feet above the level of the sea were above their averages from the 1st to the 9th of January, with the exception of the 4th, which was 0·07 in. below; they were alternately above and below from the 10th to the end of the month. The highest reading in the month was 30·41 ins. on the 30th, and the lowest 29·19 ins. both on the 24th and 25th, the range of readings being 1·22 in. From the 1st to the 22nd of February the readings of the barometer were all above their averages, with one exception, viz., the 12th, which was 0·08 in. below, the values for the 1st and 16th being as much as 0·41 in. and 0·47 in. in excess; from the 23rd to the end of the month the values were all below their averages. The maximum reading in the month was 30·28 ins. on the 16th, and the minimum 29·14 ins. on the 24th, the range being 1·14 in. In March the readings of the barometer were below their averages from the 1st to the 9th, a little above on the 10th and 11th, again below on the 12th and 13th, but to very small amounts, and from the 14th to the end of the month the values were all above their averages; on the last three days of the month they were no less than 0·51 in., 0·55 in., and 0·60 in. respectively in excess. The highest reading in the month occurred on the 18th, 30·37 ins., and the lowest on the 1st, 29·58 ins.; the range was 0·79 in.

E. & S.—550.—5/75.

A

At about London the mean increase of atmospheric pressure from December to January was 0·150 in., from January to February was 0·095 in., and from February to March was 0·097 in. In January, at stations north of Allenheads, there was a decrease of pressure from December to January, and an increase from all stations south of latitude 54°½. In February, there was an increase at all stations amounting to 0·08 in. at stations south of latitude 51°; increasing going northwards to 0·33 in. north of latitude 54°, and in March an increase at all stations not differing much from each other to the mean value of 0.12 in.

The fall of rain in the three months was 4·4 ins.; there was an excess in January of 1·1 in. over the average fall for January, and a deficiency in both February and March below their averages of 1·7 in., and thus a deficiency of 0·6 in. on the quarter; the deficiency of rain in the year 1874 was 5 ins., and in December 1873 was 1·7 in., so that the deficiency of rain from December 1873 to the present time amounts to 7·3 ins.

The average duration of the different directions of the wind referred to eight points of the compass, and the duration of each direction in each month in the quarter, were as follows:—

Direction of Wind.	January. Average.	January. 1875.	January. Departure from Average.	February. Average.	February. 1875.	February. Departure from Average.	March. Average.	March. 1875.	March. Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	1½	2	+ ½	2	2	0	2¾	4	+1¼
N.	3	0	−3	3	3	0	3¾	4	+ ¼
N.E.	3½	1	−2½	3½	6	+2½	4	8	+4
E.	¾	0	− ¾	2¼	5	+2¾	2½	7	+4½
S.E.	2¼	2	− ¼	1¼	3	+1¾	2¼	2	− ¼
S.	4¼	7	+2¾	3	3	0	2½	2	− ½
S.W.	9¾	13	+3¼	8	3	−5	7¼	2	−5¼
W.	3½	6	+2½	2½	3	+ ½	3¼	2	−1¼
Calm, nearly.	2¾	0	−2¾	2½	0	−2½	2¼	0	−2¼

The + signs denote excesses over averages; in the month of January the numbers affected with this sign are opposite to the S., S.W., and W. winds, and these were the dominant winds during this month; in the month of February and March, the + signs are exclusively opposite to E. or N. and their compounds, thus showing the prevalence, particularly in March, of these winds.

The − signs denote deficiency below averages; in January this sign is opposite to the N.E. and N. winds, and in both February and March are opposite to the S. and W. winds, thus January in all particulars was the opposite of both February and March.

1875. Months.	Temperature of Air. Mean.	Air. Diff. from average of 104 years.	Air. Diff. from average of 34 years.	Evaporation. Mean.	Evaporation. Diff. from average of 34 years.	Dew Point. Mean.	Dew Point. Diff. from average of 34 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 34 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 34 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour. Diff. from average of 34 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
Jan.	43·4	+7·0	+5·0	41·0	+4·0	38·2	+3·2	9·0	−0·6	39·4	0·230	+0·029	2·7	+0·2
Feb.	35·0	−3·6	−4·3	33·2	−4·4	30·3	−4·7	9·8	−1·5	38·9	0·168	−0·038	2·0	−0·4
Mar.	40·2	−0·9	−1·5	37·4	−2·0	33·8	−2·7	12·5	−2·2	41·3	0·194	−0·023	2·3	−0·2
Means	39·5	+0·8	−0·3	38·6	+0·6	34·1	−1·4	10·4	−1·4	39·9	0·221	+0·013	2·5	−0·1

1875. Months.	Degree of Humidity. Mean.	Humidity. Diff. from average of 34 years.	Reading of Barometer. Mean.	Barometer. Diff. from average of 34 years.	Weight of a Cubic Foot of Air. Mean.	Weight. Diff. from average of 34 years.	Rain. Amount.	Rain. Diff. from average of 60 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
Jan.	81	−7	29·762	+0·023	548	−5	3·0	+1·1	339	5	18	8	15·5	42·7
Feb.	82	+3	29·857	+0·060	559	+6	0·8	−0·7	246	21	6	1	13·5	41·9
Mar.	78	−4	29·954	+0·204	555	+5	0·6	−1·0	309	20	7	4	17·1	46·3
Means	80	−2	29·858	+0·096	554	+2	Sum 4·4	Sum −0·6	Mean 298	Sum 46	Sum 31	Sum 13	Lowest 13·5	Highest 46·3

NOTE.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the plus sign (+) signifies above the average.

Thunderstorms occurred, on the 17th of January at Leicester, Royston, and Liverpool; on the 19th at Helston; on the 20th at Guernsey, Salisbury, Halifax, Leeds, Cockermouth, Silloth, and Carlisle; on the 21st at Osborne; on the 23rd at Guernsey and Helston; on the 24th at Guernsey, Helston, Truro, Osborne, and Hastings; and on the 25th at Marlborough, Streatley, and Oxford. On the 25th of February at Osborne.

Thunder was heard, but lightning was not seen, on 20th of January at Strathfield Turgiss; on the 24th at Oxford; and on the 26th at Carlisle. On the 27th of March at Royston.

Lightning was seen, but thunder was not heard, on the 20th of January at Portsmouth, Hastings, Liverpool, and Halifax; on the 21st at Hastings; on the 22nd at Cardington; on the 24th at Portsmouth, Salisbury, Strathfield Turgiss, Weybridge Heath, Marlborough, Blackheath, Streatley, Gloucester, Cardington, Somerleyton, and Wisbech; and on the 25th at Portsmouth, Taunton, Strathfield Turgiss, and Gloucester. On the 16th of February at Hull; and on the 25th at Portsmouth.

Solar halos were seen on the 14th of January at Halifax and Hull; on the 17th and 19th at Halifax; on the 20th at Hastings; on the 22nd at Hull; on the 26th at Calcethorpe; on the 29th at Halifax; and on the 30th at Calcethorpe. On the 2nd of February at Strathfield Turgiss and Oxford; on the 3rd at Halifax; on the 16th at Calcethorpe and Halifax; and on the 26th at Strathfield Turgiss and Wisbech. On the 10th of March at Halifax; on the 14th at Hastings; on the 15th at Wisbech; on the 19th at Oxford; on the 23rd at Wisbech; and on the 25th at Calcethorpe and Hull.

Lunar halos were seen on the 13th of January at Hastings; on the 14th at Calcethorpe; on the 15th at Oxford; on the 17th at Wisbech; on the 18th at Silloth and North Shields; on the 20th at Leicester, Oxford, Wisbech, and Calcethorpe; on the 22nd at Portsmouth, Oxford, Wisbech, Calcethorpe, Eccles, and North Shields; and on the 23rd at Silloth. On the 12th of February at Wisbech; on the 15th at Eccles, Halifax, Silloth, and North Shields; and on the 16th at Oxford and Halifax. On the 14th of March at Hastings and Salisbury, on the 15th at Hastings; on the 18th at Hastings, Salisbury, Weybridge Heath, and Oxford; on the 20th at Halifax and Stonyhurst; on the 23rd at Weybridge Heath; and on the 24th at Oxford.

Auroræ boreales were seen on the 4th of March at Cardington.

Snow fell on the 1st of January at Guernsey, Salisbury, Strathfield Turgiss, Marlborough, Oxford, Gloucester, Calcethorpe, Hawarden, Eccles, Halifax, Stonyhurst, Bradford, Cockermouth, and North Shields; on the 20th at Allenheads; on the 21st at Strathfield Turgiss, Marlborough, Halifax, Stonyhurst, Allenheads, Silloth, Bywell, and North Shields; on the 22nd at Calcethorpe, Eccles, Hull, Stonyhurst, Allenheads, Bywell, and North Shields; on the 23rd at Hawarden, Liverpool, Halifax, Bradford, Allenheads, and North Shields; on the 24th at Allenheads; on the 25th at Halifax, Stonyhurst, and North Shields; on the 26th at Eccles, Halifax, Stonyhurst, Allenheads, Silloth, Bywell, and North Shields; and on the 29th at Allenheads. On the 3rd of February at Halifax; on the 4th at Somerleyton and Calcethorpe; on the 6th at Halifax and Stonyhurst; from the 7th to the 11th generally; and from the 18th of February to the 18th of March, with the exception of 3 days it fell very generally over the whole country. On the 20th of March at Hastings, Royston, and Somerleyton; on the 21st at Hastings and Stonyhurst; on the 26th at Allenheads; on the 27th at Calcethorpe and Allenheads; on the 28th at Hastings, Royston, Hull, Allenheads, and North Shields.

Hail fell on the 1st of January at Guernsey, Portsmouth, Gloucester, and Eccles; on the 2nd and 4th at Oxford; on the 17th at Leicester and Liverpool; on the 19th at Helston; on the 20th at Guernsey, Hastings, Salisbury, Cockermouth, Silloth, and Carlisle; on the 22nd at Streatley, Hawarden, Liverpool, and Eccles; on the 23rd at Guernsey and Helston; on the 24th at Guernsey, Helston, Truro, Portsmouth, Leicester, Royston, Hawarden, and Cockermouth; and on the 25th at Portsmouth and Marlborough. On the 3rd of February at Halifax; on the 8th and 9th at Taunton; on the 10th and 11th at Hastings; on the 17th at Guernsey, Cardington, and Hull; on the 18th at Guernsey, Hastings, Taunton, Salisbury, Aldershot Camp, Marlborough, Blackheath, Oxford, Gloucester, Royston, Norwich, Wisbech, Calcethorpe, Hull, and North Shields; on the 19th at Guernsey, Hastings, Taunton, Salisbury, Somerleyton, and Hull; on the 20th at Taunton and Salisbury; on the 21st at Guernsey; on the 24th at Guernsey, Taunton, and Hull; on the 25th at Osborne and Taunton; on the 26th at Truro; on the 27th at Guernsey; and on the 28th at Hull. On the 1st of March at Guernsey, Somerleyton, and Hull; on the 2nd at Guernsey; on the 7th at Allenheads; on the 11th at Calcethorpe; on the 12th at Eccles, Hull, and Bywell; on the 13th and 16th at Guernsey; on the 17th at Cardington; on the 18th at Oxford, Halifax, Hull, and Bywell; on the 20th at Wisbech, Calcethorpe, and Hull; on the 26th at Allenheads; on the 27th at Weybridge Heath, Streatley, Halifax, Hull, Cockermouth, Bywell, and North Shields; and on the 28th at Somerleyton.

Fog prevailed at one or other station on 17 days in January, viz., 1st, 3rd, 4th, 5th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 16th, 23rd, 26th, and 27th. On 19 days in February, viz., 1st, 2nd, 3rd, 5th, 6th, 7th, 8th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 18th, 19th, 22nd, 23rd, and 25th. And in March on 10 days, viz., 3rd, 4th, 5th, 10th, 12th, 15th, 16th, 19th, 24th, and 31st.

Leaf buds first appeared on the Sycamore on the 22nd of January at Llandudno; and on the 27th at Portsmouth. On the 12th of March at Strathfield Turgiss; on the 20th at Guernsey; and on the 28th at Carlisle.

Leaf buds first appeared on the Horsechestnut on the 18th of February at Portsmouth. On the 8th of March at Helston; on the 25th at Guernsey; and on the 29th at Strathfield Turgiss.

Leaf buds first appeared on the Common Poplar on the 27th of January at Portsmouth.

Leaf buds first appeared on the Hawthorne on the 20th of March at Carlisle. (*In leaf*), on the 8th of March at Helston; and on the 31st at Guernsey.

Leaf buds first appeared on the Hazel on the 4th of March at Helston.

Leaf buds first appeared on the Walnut on the 18th of February at Portsmouth.

Pear in blossom on the 22nd of March at Helston.

Peach in blossom on the 10th of March at Helston; on the 27th at Oxford; on the 29th at Guernsey; and on the 30th at Wisbech.

Plum in blossom on the 30th of March at Guernsey and Strathfield Turgiss.

Apricot in blossom on the 14th of March at Wisbech.

Woodcock last seen at Strathfield Turgiss on the 20th of February.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING MARCH 31st, 1875.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1875. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat^{n}. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY,	204	Jan.	29·758	1·285	53·5	27·0	26·5	50·3	43·4	6·9	46·7	44·6	·297	3·4	0·3	93	544	—	—	1·8	2	6	14	9	5·0	6·8	23	5·65
SAMUEL ELLIOTT HOSKINS, Esq.,		Feb.	29·783	1·229	52·0	30·0	22·0	43·9	36·6	7·3	39·9	36·7	·217	2·5	0·4	89	552	—	—	1·2	9	10	5	4	4·0	7·2	16	3·26
M.D., F.R.S., F.M.S.		Mar.	29·916	0·930	58·5	32·0	26·5	47·8	39·2	8·6	42·4	38·6	·240	2·7	0·4	87	552	—	—	1·6	12	8	4	7	4·5	5·3	8	0·67
HELSTON (Cornwall),	106	Jan.	29·800	1·382	58·0	32·0	26·0	53·4	44·6	8·8	49·2	45·9	·309	3·7	0·5	88	542	56·5	48·4	2·4	2	4	15	10	5·2	7·1	26	6·96
MATTHEW P. MOYLE, Esq., M.R.C.S.		Feb.	29·844	1·202	58·0	28·0	30·0	49·9	37·0	12·9	43·4	36·2	·214	2·7	1·6	81	550	60·0	38·0	2·0	8	12	4	4	3·7	6·9	15	2·52
		Mar.	29·982	1·034	64·0	30·0	34·0	52·7	38·4	14·3	44·6	38·1	·230	2·9	0·8	78	551	60·3	35·7	2·2	11	12	4	4	3·5	5·6	9	0·99
TRURO (Cornwall),	43	Jan.	29·847	1·188	55·0	37·0	18·0	52·3	45·4	6·9	48·8	46·1	·314	2·6	0·4	91	543	—	—	3·1	1	5	13	12	—	8·6	29	7·98
C. BARHAM, Esq., M.D., F.M.S.		Feb.	29·975	1·180	54·0	28·0	26·0	46·2	37·2	9·0	41·0	36·0	·211	2·4	0·6	83	554	—	—	1·9	8	11	5	4	—	7·9	15	2·45
		Mar.	30·096	1·073	56·0	26·0	30·0	50·0	38·2	11·8	43·3	38·1	·229	2·6	0·6	81	555	—	—	2·5	13	9	3	6	—	6·9	10	1·39
OSBORNE (Isle of Wight),	172	Jan.	29·736	1·436	53·1	26·6	26·5	49·1	40·1	9·0	44·5	43·2	·279	3·2	0·1	96	547	58·6	37·6	0·3	1	6	15	9	—	8·1	20	4·30
J. R. MANN, Esq.		Feb.	29·833	1·262	53·2	21·8	28·4	41·7	30·8	10·9	36·0	34·8	·203	2·4	0·1	96	558	56·5	28·9	0·1	9	11	4	4	—	7·1	10	2·74
		Mar.	29·953	0·916	58·9	28·9	30·0	48·8	34·1	14·7	40·9	37·3	·222	2·7	0·4	87	554	77·5	33·0	0·1	10	11	3	7	—	6·0	8	0·69
BOURNEMOUTH (Hants),	128	Jan.	29·927	1·380	54·0	27·3	26·7	48·6	40·7	7·9	45·0	41·8	·266	3·0	0·6	89	549	—	—	—	1	3	14	13	—	5·3	20	4·26
T. A. COMPTON, Esq., M.D., B.A.,		Feb.	30·064	0·960	50·9	27·7	23·2	41·8	32·3	9·5	36·4	33·8	·195	2·3	0·3	89	562	—	—	—	11	12	3	2	—	5·7	9	2·48
F.M.S.		Mar.	30·171	0·860	55·4	30·0	25·4	47·5	36·4	11·1	41·3	34·6	·202	2·4	0·6	78	558	—	—	—	13	11	2	5	—	4·7	7	1·08
PORTSMOUTH,	16	Jan.	29·914	1·423	—	25·0	—	—	37·7	—	45·9	41·7	·265	3·1	0·5	86	547	—	36·7	1·3	2	4	14	11	1·2	7·9	23	3·98
WILLIAM C. ELLIS, Esq.		Feb.	29·908	1·183	—	21·8	—	—	28·5	—	37·5	33·9	·195	2·2	0·4	87	539	—	27·5	1·0	9	12	4	3	2·3	7·3	18	2·73
MANOR HOUSE (Hastings),	167	Jan.	29·794	1·578	50·1	23·4	26·7	46·7	40·4	6·3	43·7	41·1	·258	3·0	0·3	90	548	—	—	1·7	2	2	17	10	—	7·5	21	4·01
ALEX. E. MURRAY, Esq., F.M.S.		Feb.	29·840	1·170	49·5	25·5	24·0	40·1	32·6	7·5	36·2	32·0	·182	2·1	0·4	85	558	—	—	1·4	12	9	4	3	—	6·7	14	0·95
		Mar.	29·955	0·835	54·6	26·9	27·7	45·5	35·6	9·9	40·0	34·5	·200	2·3	0·6	81	556	—	—	1·9	14	7	4	6	—	7·8	9	0·86
TAUNTON (Somerset),	80	Jan.	29·826	1·592	56·0	9·0	47·0	50·9	40·4	10·5	45·9	42·9	·277	3·2	0·4	90	547	52·8	37·9	0·8	1	4	6	20	6·7	8·0	21	3·15
JAMES BOTTOMLEY, Esq.		Feb.	29·959	1·242	56·0	22·1	33·9	44·2	30·8	13·4	36·8	35·4	·204	2·4	0·2	95	561	48·9	29·4	0·3	5	14	3	6	2·6	8·0	8	2·22
		Mar.	30·080	1·052	58·1	25·1	33·0	48·0	36·0	12·0	41·7	37·0	·222	2·6	0·4	85	556	56·0	32·6	0·5	9	12	4	6	4·0	8·0	5	1·10
WILTON HOUSE (near Salisbury),	186	Jan.	29·724	1·508	54·5	13·0	41·5	49·8	36·4	13·4	43·6	41·4	·262	3·0	0·3	92	547	67·3	34·6	1·6	3	4	11	13	5·2	8·0	23	5·61
T. CHALLIS, Esq.		Feb.	19·822	1·168	55·5	20·0	35·5	42·4	27·6	14·8	35·2	32·6	·186	2·2	0·3	90	559	65·6	26·2	1·2	6	15	4	3	4·0	8·2	9	2·56
		Mar.	29·952	0·914	60·0	25·0	35·0	50·1	32·3	17·8	41·1	37·5	·223	2·6	0·4	89	554	82·3	30·6	1·6	13	10	3	5	3·1	8·5	6	1·54
BARNSTAPLE (Devon),	43	Jan.	29·838	1·570	57·0	27·5	29·5	51·7	44·0	7·7	47·8	44·9	·298	3·3	0·4	90	544	—	—	1·3	0	4	10	8	—	5·3	26	5·79
T. MACKRELL, Esq.		Feb.	29·988	1·230	53·0	30·0	23·0	44·8	35·5	9·3	39·5	36·5	·216	2·6	0·3	90	557	—	—	1·1	7	10	7	4	—	5·8	8	1·79
		Mar.	30·101	1·090	57·0	29·0	28·0	50·0	39·4	10·6	43·8	38·8	·236	2·8	0·5	82	554	—	—	1·3	9	9	4	9	—	7·8	8	1·23
ALDERSHOT CAMP (Hants).	325	Jan.	29·566	1·520	52·2	14·0	38·2	48·1	38·2	9·9	43·0	40·3	·252	2·6	0·4	91	545	67·0	34·8	1·7	2	4	14	11	1·8	7·8	21	4·53
JOHN ARNOLD, Esq., M.S.C., F.M.S.		Feb.	29·674	1·268	55·0	21·6	33·4	41·0	29·5	11·5	34·3	33·5	·192	2·3	0·1	96	557	68·1	24·9	1·4	9	8	6	5	1·9	8·1	9	3·05
		Mar.	29·768	0·830	58·0	26·0	32·0	48·9	34·1	14·8	39·8	33·8	·195	2·2	0·6	79	552	79·6	30·3	1·7	12	8	3	8	1·8	7·4	6	0·64
STRATHFIELD TURGISS (Hants),	197	Jan.	29·728	1·699	53·5	10·3	43·0	47·8	37·9	9·9	43·6	40·9	·256	3·0	0·2	90	547	69·5	34·2	0·6	2	5	11	13	4·5	7·4	22	3·72
REV. C. H. GRIFFITH, M.A., F.M.S.		Feb.	29·834	1·250	51·2	23·0	28·2	40·3	30·3	10·0	35·2	32·6	·185	2·2	0·2	90	559	59·0	28·0	0·6	9	10	3	4	2·1	8·0	15	2·59
		Mar.	29·938	0·918	57·2	26·8	30·4	48·6	35·2	13·4	41·1	35·5	·204	2·4	0·6	81	554	82·3	30·2	0·7	13	10	1	7	4·0	6·6	7	0·74

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1875. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean. Of all Highest.	Temperature of Air in Month. Mean. Of all Lowest.	Temperature of Air in Month. Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a Cubic foot of Air. Mean.	Vapour. In a Cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
WEYBRIDGE HEATH (Surrey), WILLIAM F. HARRISON, ESQ., F.M.S.	150	Jan.	29.801	1.457	53.8	15.0	38.8	47.5	38.6	8.9	43.2	40.8	.255	2.9	0.3	90	549	58.0	35.7	1.0	3	6	14	8	1.4	7.4	23	5.76
		Feb.	29.901	1.118	51.0	20.0	31.0	40.3	30.5	9.8	35.2	32.4	.184	2.1	0.3	90	560	55.9	26.0	0.8	10	7	8	3	0.7	7.7	11	1.29
		Mar.	30.009	0.895	60.0	27.3	32.7	47.9	34.3	13.6	40.7	35.4	.207	2.4	0.5	82	556	71.5	31.7	0.9	9	11	7	4	0.7	7.9	7	0.56
MARLBOROUGH, GREEN, (Wilts), REV. THOMAS A. PRESTON, M.A., F.M.S.	474	Jan.	29.402	1.497	52.7	28.9	23.8	47.6	39.5	8.1	43.7	41.2	.260	3.0	0.3	90	541	64.1	37.3	0.9	1	3	13	14	—	8.3	24	4.53
		Feb.	29.528	1.176	52.4	23.6	28.8	40.0	30.8	9.2	34.8	31.9	.179	2.1	0.2	80	554	64.5	29.4	0.5	4	16	3	5	—	6.7	13	2.13
		Mar.	29.633	0.926	55.2	27.7	27.5	46.9	34.5	12.4	40.3	36.0	.212	2.5	0.4	84	549	84.5	31.3	—	8	12	2	9	—	6.6	8	1.33
BLACKHEATH (London), JAMES GLAISHER, ESQ., F.R.S.	159	Jan.	29.762	1.437	54.1	19.8	34.3	47.8	39.6	8.2	43.8	40.7	.255	2.9	0.3	89	548	62.9	37.1	0.7	2	3	13	13	—	7.2	22	3.11
		Feb.	29.857	1.210	50.7	26.6	24.1	40.4	31.8	8.6	35.5	33.7	.196	2.2	0.3	93	559	63.9	29.6	0.8	7	10	6	5	—	8.2	16	0.95
		Mar.	29.954	0.897	57.0	28.6	28.4	47.1	36.0	11.1	40.7	35.9	.211	2.4	0.5	81	555	76.3	32.1	0.9	8	10	4	9	—	7.5	9	0.70
STREATLEY VICARAGE (Berks), REV. J. SLATTER, M.A., F.R.A.S., F.M.S.	150	Jan.	29.755	1.594	54.3	14.9	39.4	48.3	39.9	8.4	45.2	40.2	.267	3.1	0.6	84	546	51.6	—	1.2	4	2	12	13	—	7.8	22	4.25
		Feb.	29.892	1.265	52.7	22.4	30.3	41.6	30.2	11.4	35.6	34.4	.197	2.8	0.2	94	560	46.6	—	1.1	9	11	4	4	—	8.1	13	2.11
		Mar.	29.996	0.900	58.2	27.8	30.4	48.2	35.2	13.0	41.5	35.8	.228	2.7	0.6	82	553	54.6	—	1.3	13	9	3	6	—	7.6	8	1.11
CAMDEN TOWN (London), G. J. SYMONS, ESQ., F.M.S.	123	Jan.	29.805	1.563	53.8	20.7	33.1	48.2	39.2	9.0	43.2	41.9	.267	3.0	0.3	95	549	54.5	33.2	—	2	3	11	15	—	7.0	23	3.22
		Feb.	29.905	1.161	51.2	25.1	26.1	40.8	31.0	9.8	34.5	35.1	.190	2.2	0.2	95	561	54.4	29.6	—	10	7	5	6	—	7.5	16	1.06
		Mar.	30.018	0.949	59.5	27.1	32.4	48.3	35.3	13.0	41.7	35.7	.209	2.4	0.6	80	555	71.3	33.3	—	14	6	3	8	—	7.6	11	0.69
CHISWICK (Middlesex), PROF. THISELTON DYER, M.A., B.Sc., F.L.S.	25	Jan.	29.903	1.486	56.5	21.0	35.5	40.2	39.4	9.8	44.5	41.2	.259	2.9	0.3	88	549	65.1	33.9	—	3	4	14	10	—	—	20	3.49
		Feb.	29.991	1.228	52.0	24.5	27.5	41.6	30.1	11.5	35.3	34.5	.200	2.3	0.2	98	561	61.6	27.1	—	8	9	6	5	—	—	12	1.02
		Mar.	30.113	0.898	58.7	27.7	31.0	47.9	35.0	12.9	41.0	37.2	.225	2.6	0.4	86	557	81.5	31.2	—	10	10	4	7	—	—	9	0.61
TOWN MUSEUM (Leicester), W. J. HARRISON, ESQ.	245	Jan.	29.603	1.622	54.8	10.7	44.1	46.5	38.0	8.5	42.4	39.8	.245	2.9	0.3	90	546	62.0	33.4	1.4	1	4	16	10	—	8.2	22	2.60
		Feb.	29.770	1.126	53.1	25.6	27.5	39.9	31.9	8.0	35.5	31.7	.179	2.0	0.4	86	557	62.5	28.1	0.8	8	10	6	4	—	8.4	14	1.02
		Mar.	29.887	1.017	56.3	26.8	29.5	45.6	35.3	10.3	40.1	32.5	.185	2.3	0.6	78	553	81.1	31.4	1.1	11	10	5	5	—	8.5	10	0.64
OXFORD (Oxfordshire), REV. R. MAIN, M.A., F.R.S., F.R.A.S.	210	Jan.	29.674	1.553	55.1	29.9	25.2	48.7	40.9	7.8	44.6	41.3	.260	2.9	0.4	88	545	70.4	38.2	1.1	0	4	16	11	1.4	8.6	24	3.37
		Feb.	29.797	1.198	54.8	25.0	29.8	40.0	31.2	8.8	35.5	33.0	.189	2.2	0.3	90	558	62.2	29.9	0.8	8	11	6	3	2.0	8.6	13	1.45
		Mar.	29.916	0.948	59.2	27.8	31.4	47.4	36.3	11.1	42.0	34.6	.203	2.3	0.8	76	555	84.8	33.5	1.0	11	10	3	7	2.9	8.4	9	1.08
GLOUCESTER (Gloucester), E. TOLLER, ESQ., M.D.	100	Jan.	29.834	1.648	54.3	16.4	37.9	49.3	40.4	8.9	44.9	41.9	.265	3.0	0.4	90	548	58.4	38.4	0.6	2	1	13	15	0.6	7.3	21	4.06
		Feb.	29.997	1.197	53.7	24.4	29.3	45.2	31.4	13.8	37.0	34.8	.202	2.3	0.3	92	560	58.6	30.5	0.4	8	9	5	6	1.1	7.4	11	1.50
		Mar.	30.093	1.004	61.5	25.4	36.1	49.3	31.7	17.6	40.2	34.2	.198	2.3	0.1	80	558	78.2	32.0	0.5	11	10	5	5	1.4	6.9	7	0.90
ROYSTON (Hertfordshire), HALE WORTHAM, ESQ., F.R.A.S., F.M.S.	269	Jan.	29.614	1.588	55.0	8.7	46.3	47.5	36.5	11.0	42.3	38.8	.226	2.7	0.4	88	547	—	—	—	1	3	17	10	—	6.7	17	2.09
		Feb.	29.783	1.136	52.2	18.5	33.7	41.4	29.3	12.1	35.0	30.8	.172	2.0	0.4	84	558	—	—	—	10	7	5	6	—	8.0	11	0.75
		Mar.	29.889	0.923	57.8	21.4	36.4	47.4	32.7	14.7	39.5	33.8	.194	2.3	0.6	80	555	—	—	—	15	8	3	5	—	7.7	9	0.47
CARDINGTON (near Bedford), MR. MACLAREN, Assistant to S. C. WHITBREAD, ESQ., F.R.S.	105	Jan.	29.797	1.616	55.0	9.0	46.0	47.1	37.0	10.1	42.4	40.2	.251	2.9	0.4	91	550	49.0	31.8	1.6	1	3	16	11	—	7.2	19	2.30
		Feb.	29.944	1.156	53.4	22.0	31.4	40.9	29.9	11.0	35.0	33.4	.192	2.2	0.2	94	561	49.2	22.2	1.5	9	8	4	7	—	8.1	12	1.00
		Mar.	30.041	0.910	59.0	23.6	35.4	47.4	34.0	13.4	40.0	36.8	.218	2.5	0.4	89	557	64.5	28.0	2.5	12	12	3	4	—	7.2	6	0.50
ST. DAVID'S COLLEGE, LAMPETER (Cardiganshire), PROF. A. W. SCOTT.	420	Jan.	29.412	1.446	59.0	29.5	29.5	51.3	38.6	12.7	45.1	40.9	.255	2.9	0.5	86	540	62.2	—	0.7	1	0	19	11	—	9.6	27	5.91
		Feb.	29.597	1.214	48.5	20.0	28.5	42.9	31.1	11.8	36.9	34.7	.201	2.4	0.3	91	553	58.2	—	—	9	8	8	3	—	—	8	1.56
		Mar.	29.746	1.200	61.0	23.0	38.0	48.9	33.0	15.9	40.3	36.7	.218	2.5	0.4	88	551	80.3	—	—	9	10	3	9	—	—	10	1.79
SOMERLEYTON RECTORY (Suffolk), REV. C. J. STEWARD, F.M.S.	50	Jan.	29.857	1.544	53.0	17.5	35.5	48.1	36.2	11.9	41.7	40.9	.256	3.0	0.1	97	552	—	26.2	1.2	3	2	15	11	6.0	6.9	16	1.87
		Feb.	29.991	1.068	51.3	23.7	27.6	40.2	30.9	9.3	35.3	34.4	.200	2.2	0.1	96	562	—	22.8	1.0	8	11	5	4	5.1	7.3	15	1.12
		Mar.	30.082	0.894	61.0	28.7	32.3	47.4	34.2	13.2	40.2	36.8	.218	2.5	0.4	89	558	—	24.2	1.2	8	12	4	7	4.7	6.3	11	0.53
NORWICH (Norfolk), JOHN QUINTON, ESQ., JUN.	42	Jan.	29.860	1.590	55.0	10.5	44.5	45.8	35.7	10.1	40.9	40.2	.249	2.9	0.5	98	553	—	—	—	1	7	15	8	—	—	19	2.26
		Feb.	30.008	1.040	50.5	23.5	27.0	38.4	30.5	7.9	34.3	34.3	.199	2.3	0.1	100	563	—	—	—	5	13	3	7	—	—	12	1.26
		Mar.	30.096	0.918	57.2	28.5	28.7	45.3	34.1	11.2	39.2	37.1	.222	2.6	0.3	93	559	—	—	—	10	10	4	7	—	—	8	0.44

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1875. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	Jan.	29·864	1·626	54·1	11·8	42·3	46·6	37·1	9·5	41·6	39·3	·242	2·8	1·3	93	552	61·7	32·7	0·7	2	6	15	8	5·0	7·4	19	2·05
		Feb.	30·041	1·104	52·0	24·5	27·5	40·6	31·8	8·8	35·8	32·9	·189	2·1	0·3	91	563	68·1	28·3	0·5	10	8	4	6	2·4	7·2	14	1·21
		Mar.	30·128	0·848	59·0	27·0	32·0	48·2	34·8	13·4	40·3	35·6	·208	2·4	0·4	84	559	89·5	29·5	0·7	14	8	3	6	3·0	7·2	9	0·44
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	Jan.	29·674	1·660	61·8	25·7	36·1	51·6	41·2	10·4	46·2	41·5	·263	3·1	0·5	85	543	—	—	0·8	2	2	16	11	—	7·4	21	3·03
		Feb.	29·952	1·086	55·5	29·5	26·0	43·1	35·8	7·3	39·3	35·8	·211	2·4	0·4	88	556	—	—	1·0	5	11	7	5	—	7·0	16	2·14
		Mar.	30·055	1·180	56·6	30·9	25·7	48·0	37·8	10·2	42·5	36·9	·220	2·5	0·6	81	555	—	—	1·0	4	10	6	11	—	7·4	9	0·89
NOTTINGHAM (Notts), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	183	Jan.	29·640	1·540	54·5	12·0	42·5	42·9	36·6	6·3	40·6	37·4	·224	2·6	0·4	89	549	56·5	29·1	0·7	1	6	15	9	3·6	8·0	26	2·70
		Feb.	29·852	1·070	52·7	21·8	30·9	40·2	30·3	9·9	35·0	33·1	·190	2·2	0·2	93	559	56·3	25·5	0·6	7	10	5	6	1·6	7·9	18	1·10
		Mar.	29·934	0·926	57·2	28·1	29·1	46·2	34·6	11·6	39·7	33·9	·195	2·3	0·6	80	556	72·3	27·8	0·7	9	13	3	6	2·4	7·8	19	0·57
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	Jan.	29·812	1·584	54·8	7·2	47·6	46·5	32·2	14·3	41·3	37·5	·225	2·6	0·4	87	552	58·6	31·0	1·7	1	3	18	9	—	7·3	20	1·70
		Feb.	29·487	1·048	51·8	23·2	28·6	40·3	28·3	12·0	34·6	31·4	·177	2·1	0·3	88	568	68·8	25·9	1·6	5	10	7	6	—	8·7	11	1·68
		Mar.	30·062	0·930	58·6	20·0	38·6	45·2	30·2	15·0	38·2	33·0	·188	2·2	0·5	82	560	87·8	27·9	1·9	11	8	5	7	—	7·8	13	0·77
CALCETHORPE MANOR (near) Louth (Lincolnshire), D. Grant Briggs, Esq., F.M.S.	382	Jan.	29·438	1·714	52·1	7·0	45·1	44·3	35·3	9·0	39·9	37·6	·225	2·7	0·2	92	546	67·0	32·2	1·4	2	3	15	11	6·6	7·4	23	2·19
		Feb.	29·647	1·034	51·0	23·3	27·7	38·2	31·4	6·8	34·4	31·2	·175	2·0	0·3	87	556	65·8	28·5	1·2	8	10	4	6	6·6	8·6	16	1·38
		Mar.	29·730	1·068	55·8	27·9	27·9	43·8	33·8	10·0	38·3	34·3	·198	2·3	0·4	86	554	85·7	30·3	1·2	12	8	4	7	7·4	8·0	14	0·65
HAWARDEN (Flint), T. Moffat, Esq., M.D., F.R.A.S.	270	Jan.	29·485	1·808	58·5	17·0	41·5	47·5	39·3	8·2	43·4	—	—	—	—	—	—	52·3	24·8	2·0	5	1	18	7	0·8	7·3	27	3·06
		Feb.	29·760	1·112	54·0	28·0	26·0	40·7	33·5	7·2	36·6	34·1	·198	2·2	0·3	92	556	52·4	19·2	1·5	5	8	9	6	0·3	7·2	16	1·89
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	Jan.	29·572	1·783	55·4	18·0	37·4	47·2	38·9	8·3	43·3	39·4	·239	2·8	0·4	85	545	—	—	1·5	0	9	13	9	—	7·6	24	3·60
		Feb.	29·837	1·091	54·9	27·1	27·8	41·2	33·6	7·6	37·0	33·4	·191	2·2	0·4	87	557	—	—	1·1	6	12	5	5	—	7·6	12	1·56
		Mar.	29·9.5	1·095	55·0	29·5	25·5	44·7	36·3	8·4	40·0	34·0	·196	2·3	0·6	79	555	—	—	1·3	4	10	6	11	—	6·8	12	0·65
ECCLES (near Manchester), T. Mackereth, Esq., F.R.A.S., F.M.S.	145	Jan.	29·664	1·690	57·0	12·8	44·2	47·7	37·2	10·5	42·8	39·3	·240	2·8	0·4	87	546	49·1	30·3	0·4	1	7	16	7	2·6	7·5	24	3·47
		Feb.	29·904	1·102	51·2	23·3	27·9	41·3	31·8	9·5	36·6	32·5	·184	2·1	0·4	86	559	45·1	26·3	0·1	7	10	6	5	2·4	8·2	12	0·83
		Mar.	29·997	1·102	57·5	25·1	32·4	47·3	33·8	13·5	40·2	35·4	·207	2·4	0·7	83	556	55·6	27·8	0·3	8	10	5	8	2·9	7·5	13	0·78
MOOR SIDE OBSERVATORY, HALIFAX (Yorkshire), Louis J. Crossley, Esq., F.R.A.S.	429	Jan.	29·327	1·654	53·8	12·0	41·8	46·6	36·8	9·8	41·6	37·0	·220	2·6	0·4	85	542	55·0	33·2	0·9	3	6	11	11	2·5	7·8	23	5·43
		Feb.	29·560	1·043	51·5	26·2	25·3	39·4	32·2	7·2	33·1	31·3	·176	2·1	0·1	93	556	51·7	29·2	0·7	6	13	3	6	1·0	9·5	12	1·24
		Mar.	29·644	0·967	54·6	26·3	28·3	44·8	34·6	10·2	38·2	35·3	·206	2·4	0·3	89	552	67·5	31·3	1·0	7	12	3	9	2·8	8·5	13	0·68
BERMERSIDE OBSERVATORY, HALIFAX (Yorkshire), Edward Crossley, Esq., F.R.A.S.	520	Jan.	29·256	1·710	55·3	12·5	42·8	44·3	36·7	7·6	40·8	38·1	·230	2·7	0·3	90	542	61·7	33·4	0·8	1	8	11	11	—	8·0	20	5·77
		Feb.	29·503	1·052	51·5	24·2	27·3	38·0	31·9	6·1	34·0	32·6	·186	2·2	0·1	95	554	55·7	29·9	0·4	8	9	3	8	—	8·7	10	1·44
		Mar.	29·586	0·906	52·5	26·0	26·5	44·0	34·2	9·8	38·2	34·4	·199	2·3	0·4	87	552	71·1	31·6	0·6	8	8	5	10	—	8·1	9	0·76
THE PARK, HULL (Yorkshire), Mr. E. Peak.	12	Jan.	29·817	1·702	56·0	12·0	44·0	44·5	35·2	9·3	41·1	37·0	·219	2·6	0·4	82	552	51·5	33·9	—	—	—	—	—	0·9	—	21	2·48
		Feb.	30·062	1·116	54·0	23·0	31·0	40·4	30·2	10·2	32·6	31·0	·174	2·1	0·2	96	566	51·6	30·0	—	—	—	—	—	2·3	—	18	1·18
		Mar.	30·145	0·940	58·0	26·0	32·0	45·5	34·0	11·5	40·0	34·5	·200	2·3	0·6	81	559	62·4	32·0	—	—	—	—	—	2·6	—	14	0·91
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	363	Jan.	29·386	1·719	54·3	24·4	29·9	47·1	38·2	8·9	42·5	39·7	·215	2·8	0·3	90	542	66·3	35·1	—	3	6	13	9	—	8·5	28	5·14
		Feb.	29·632	1·055	50·4	25·0	25·4	40·9	32·4	8·5	36·5	32·8	·187	2·2	0·4	87	554	70·5	30·2	—	8	12	4	4	—	8·5	18	1·40
		Mar.	29·748	1·144	57·2	24·0	33·2	46·7	34·9	11·8	39·9	35·5	·208	2·4	0·5	85	552	87·3	32·4	—	8	11	5	7	—	8·1	15	1·25
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	Jan.	29·449	1·258	57·2	13·0	44·2	47·4	37·6	9·8	42·6	38·8	·236	2·7	0·4	88	548	49·5	—	1·5	3	4	14	10	—	7·8	18	4·21
		Feb.	29·665	1·018	50·5	27·8	22·7	40·6	32·6	8·0	36·1	32·1	·183	2·1	0·4	87	555	48·8	—	1·2	8	8	4	8	—	9·0	11	1·07
		Mar.	29·773	1·029	55·0	30·2	24·8	44·7	35·2	9·5	39·4	35·1	·210	2·4	0·5	86	553	55·7	—	1·3	6	12	2	11	—	8·2	11	0·46
LEEDS PHILOSOPHICAL HALL (Yorkshire), Louis C. Miall, Esq.	137	Jan.	29·681	1·446	55·0	12·0	43·0	46·3	36·9	9·6	42·5	38·1	·232	2·7	0·4	85	548	51·2	—	1·1	3	3	12	13	—	8·2	25	3·51
		Feb.	29·922	1·131	53·0	26·0	27·0	41·0	32·1	8·9	36·8	31·5	·178	2·1	0·4	82	559	48·8	—	1·0	6	10	7	5	—	9·1	16	1·29
		Mar.	30·025	1·030	57·0	28·0	29·0	47·5	34·8	12·7	40·5	34·2	·201	2·3	0·6	79	557	57·9	—	1·0	10	9	4	8	—	8·4	15	0·48

Llandudno.—The readings of the barometer for the month of January appear to be too low by one tenth of an inch.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1875. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
COCKERMOUTH (Cumberland),	146	Jan.	29.582	1.768	54.6	20.5	34.1	47.6	38.8	8.8	43.5	40.2	.250	2.8	0.4	88	545	55.7	30.6	0.9	1	4	18	8	3.9	7.5	24	4.76
H. Dodgson, Esq., M.D., F.R.A.S.,		Feb.	29.901	0.986	49.4	22.7	26.7	41.4	33.1	8.3	37.0	33.6	.194	2.2	0.4	88	558	58.0	23.9	0.4	8	10	7	3	1.4	7.2	10	1.38
F.M.S.		Mar.	29.978	1.242	52.7	22.8	29.9	46.9	35.0	11.9	40.6	35.8	.206	2.4	0.6	84	555	78.7	26.7	0.6	6	8	9	8	2.1	6.3	9	1.33
ALLENHEADS (Northumberland),	1360	Jan.	28.298	1.342	48.5	16.0	32.5	41.6	31.8	9.8	36.5	—	—	—	—	—	—	63.2	31.3	1.8	2	2	18	9	—	7.5	24	6.08
Mr. T. Kidd, Assistant to W. B.		Feb.	28.568	0.907	48.5	21.5	27.0	37.5	28.4	9.1	31.9	—	—	—	—	—	—	62.0	27.6	1.3	9	10	4	5	—	7.9	19	2.62
Beaumont, Esq., M.P.		Mar.	28.650	0.968	58.5	21.5	37.0	41.4	30.4	11.0	34.9	—	—	—	—	—	—	71.6	29.3	1.7	6	8	6	11	—	7.0	17	1.39
SILLOTH RECTORY (Cumberland),	28	Jan.	29.696	1.888	54.0	11.3	42.7	46.9	37.1	9.8	42.1	39.4	.242	2.7	0.4	90	548	58.7	34.1	1.5	2	8	10	11	8.9	7.0	26	4.17
Rev. Francis Redford, M.A.,		Feb.	30.039	0.989	51.2	24.7	26.5	42.6	33.3	9.3	37.2	33.1	.189	2.2	0.4	86	560	62.7	30.2	1.4	8	10	4	6	6.7	7.1	8	1.02
F.R.A.S., F.M.S.		Mar.	30.110	1.245	59.0	23.5	35.5	49.0	34.5	14.5	40.7	36.0	.211	2.5	0.6	84	558	76.2	31.9	1.5	10	9	2	10	7.3	6.0	7	0.92
CARLISLE (Cumberland),	114	Jan.	29.626	1.937	53.9	25.6	28.3	44.4	37.3	7.1	41.5	38.5	.234	2.7	0.3	90	548	54.3	31.9	2.0	2	4	16	9	6.3	7.9	23	3.81
I. Cartmell, Esq., F.M.S.		Feb.	29.967	0.947	50.9	21.9	29.0	40.0	32.2	7.8	35.9	32.8	.187	2.1	0.4	88	561	56.2	27.2	1.9	5	12	5	6	6.7	7.6	10	0.71
		Mar.	30.040	1.206	56.1	20.1	36.0	47.4	33.7	13.7	39.8	33.8	.194	2.4	0.4	79	557	69.7	28.8	2.0	7	10	5	9	7.1	6.7	10	0.72
BYWELL (Northumberland),	87	Jan.	29.628	1.796	55.0	10.0	45.0	46.2	36.4	9.8	41.2	34.9	.202	2.4	0.7	79	548	48.9	30.9	1.3	3	6	8	11	—	6.9	23	2.58
Mr. John Dawson, Assistant to		Feb.	29.949	0.978	53.0	25.0	28.0	42.5	33.7	8.8	37.3	32.0	.181	2.1	0.4	82	559	46.9	27.9	1.3	5	10	4	9	—	7.0	21	1.83
W. B. Beaumont, Esq., M.P.		Mar.	30.019	1.090	57.0	27.0	30.0	47.1	36.2	10.9	40.5	32.8	.185	2.3	0.6	74	556	55.5	30.2	1.5	6	9	5	11	—	5.8	15	0.98
NORTH SHIELDS (Northumberland),	124	Jan.	29.653	1.857	53.8	11.2	42.6	45.0	36.0	9.0	40.4	37.0	.222	2.5	0.4	88	550	—	34.3	1.5	6	2	9	14	—	7.7	23	2.33
Robert Spence, Esq.		Feb.	29.972	0.968	52.0	27.4	24.6	40.4	32.7	7.7	36.5	31.1	.178	2.1	0.4	81	560	—	31.9	1.4	9	8	5	6	—	7.7	19	1.21
		Mar.	30.032	1.387	54.3	31.0	23.3	45.5	35.9	9.6	39.9	33.7	.194	2.4	0.4	79	557	—	34.5	1.6	8	6	8	9	—	6.8	9	0.51
MILTOWN (Banbridge, Ireland),	200	Jan.	29.347	1.645	55.0	26.0	29.0	48.4	38.4	10.0	43.9	40.6	.255	3.0	0.4	88	540	56.4	33.2	2.4	1	6	19	5	—	6.6	24	3.91
John P. Smyth, Esq., jun., M.A.,		Feb.	29.729	0.948	54.0	24.0	30.0	43.5	32.7	10.8	37.9	35.1	.204	2.4	0.3	89	554	63.6	29.5	1.4	12	6	5	5	—	5.6	13	1.79
M.I.C.E.I., F.G.S.		Mar.	29.809	1.165	55.0	26.0	29.0	47.4	36.9	10.5	41.9	37.6	.226	2.6	0.5	86	551	78.8	33.9	2.1	8	10	7	6	—	5.8	15	0.96

NOTE.—*The Barometer Reading*,	LLANDUDNO,	7th January,	9h. a.m.,	29.340 in.,	has been altered to	29.940 in.
"	ALLENHEADS,	9th March,	9h. a.m.,	27.885 in.,	"	28.885 in.
The Maximum Thermometer Reading,	CHISWICK,	22nd February,	9h. a.m.,	29°.2	"	39°.2
"	ALLENHEADS,	8th March,	9h. a.m.,	68°.5	"	58°.5

NOTE.—ALLENHEADS. There are no readings of the Wet-bulb Thermometer given in the months of January, February, and March.

Second Rain-gauges are placed—

				January.	February.	March.	Total during the Quarter.
At Portsmouth,	at the height of 20 feet	*above the ground*,	the amount collected was	3.77 inches.	2.50 inches.	— inches.	— inches.
" Strathfield Turgiss,	" 38 feet	"	"	2.53 "	1.58 "	0.46 "	4.57 "
" Eccles (Manchester),	" 34 feet	"	"	2.61 "	0.59 "	0.61 "	3.81 "
" Miltown (Ireland),	" 40 feet	"	"	2.81 "	1.65 "	— "	— "
" Oxford,	" 22 feet	"	"	3.30 "	1.19 "	1.09 "	5.58 "
" Cardington,	" 38 feet	"	"	1.90 "	0.90 "	0.40 "	3.20 "
" Nottingham,	" 39 feet	"	"	2.27 "	1.35 "	0.54 "	4.16 "
" Wisbech,	" 8 feet	"	"	1.91 "	1.05 "	0.40 "	3.36 "
" Aldershot Camp,	" 25 feet	"	"	3.62 "	2.68 "	0.51 "	6.81 "

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°							
Guernsey	29·790	58·5	27·0	31·5	47·3	39·7	25·0	7·6	43·0	40·0	·251	2·9	0·4	90	549	—	—	1·5	8	8	8	7	4·5	6·4
Helston	29·741	64·0	28·0	36·0	52·0	40·0	30·0	12·0	44·4	40·1	·251	3·1	1·0	82	548	61·9	38·4	2·2	7	9	8	6	4·1	6·5
Truro	29·769	56·0	26·0	30·0	49·5	40·3	24·7	9·2	44·4	40·1	·251	2·5	0·5	85	551	—	—	2·5	7	8	7	7	—	7·8
Osborne	29·804	58·9	24·8	34·1	46·5	35·0	28·3	11·5	40·5	38·4	·235	2·8	0·2	96	553	64·2	33·2	0·2	7	9	7	7	—	7·2
Bournemouth	—	55·4	27·3	28·1	46·0	36·5	25·1	9·5	40·9	36·7	·221	2·6	0·5	85	555	—	—	—	8	9	6	7	—	5·2
Hastings	29·830	54·6	23·4	31·2	44·1	36·2	26·1	7·9	40·0	35·9	·213	2·5	0·4	85	554	—	—	1·7	9	6	8	6	—	7·3
Taunton	29·811	58·1	9·0	49·1	47·7	35·7	38·0	12·0	41·5	38·4	·234	2·7	0·3	90	554	52·6	33·3	0·5	5	10	4	11	4·4	8·0
Salisbury	29·817	60·0	13·0	47·0	47·4	32·1	37·3	15·3	40·0	37·2	·224	2·6	0·3	90	553	71·7	30·5	1·5	7	10	6	7	4·1	8·2
Barnstaple	29·773	57·0	27·5	29·5	48·8	39·6	26·8	9·2	43·7	40·1	·250	2·9	0·4	87	552	—	—	1·2	5	8	10	7	—	6·3
Aldershot Camp	29·812	58·0	14·0	44·0	46·0	34·0	34·5	12·0	39·0	35·9	·213	2·4	0·4	89	531	71·6	30·0	1·6	8	7	8	8	1·8	7·8
Strathfield Turgiss	29·837	57·2	10·3	46·9	45·6	34·5	33·9	11·1	40·0	36·3	·216	2·5	0·3	87	553	70·3	30·8	0·6	8	8	6	8	3·5	7·3
Weybridge Heath	29·857	60·0	15·0	45·0	45·2	34·5	34·1	10·7	39·7	36·2	·215	2·5	0·4	87	555	61·8	31·1	0·9	7	8	10	5	0·9	7·7
Marlborough Green	29·798	55·2	23·6	31·6	44·8	34·9	26·7	9·9	39·7	36·4	·227	2·5	0·3	88	548	71·0	32·7	—	4	10	6	9	—	7·2
Blackheath	29·815	57·0	19·8	37·2	45·1	35·8	28·9	9·3	40·0	36·8	·221	2·5	0·4	88	554	67·7	32·9	0·8	6	8	8	9	—	7·6
Streatley Vicarage	29·818	58·2	14·9	43·3	46·0	35·1	33·4	10·9	40·8	36·8	·231	2·7	0·5	87	554	50·9	—	1·2	9	7	6	8	—	7·8
Camden Town	29·824	59·5	20·7	38·8	45·8	35·2	30·5	10·6	39·8	36·9	·222	2·5	0·4	90	555	60·1	32·0	—	9	5	6	10	—	7·4
Chiswick	29·801	58·7	21·0	37·7	46·2	34·8	31·3	11·4	40·3	37·6	·228	2·6	0·3	91	556	69·4	30·7	—	7	8	8	7	—	—
Leicester	29·823	56·3	10·7	45·6	44·0	35·1	33·7	8·9	39·3	34·7	·203	2·4	0·4	85	553	68·5	31·0	1·1	7	8	9	6	—	8·4
Oxford	29·814	59·2	25·0	34·2	45·4	36·1	28·8	9·3	40·7	36·3	·217	2·5	0·5	85	553	72·5	33·9	1·0	6	8	8	7	2·1	8·1
Gloucester	29·865	61·5	16·4	45·1	47·9	34·5	34·4	13·4	40·7	37·0	·222	2·5	0·3	87	555	65·1	33·6	0·8	7	7	8	9	1·0	7·[illegible]
Royston	29·865	57·8	8·7	49·1	45·4	32·8	38·8	12·6	38·9	34·5	·197	2·3	0·5	84	553	—	—	—	9	6	8	7	—	7·1
Cardington	29·819	59·0	9·0	50·0	45·1	33·6	37·6	11·5	39·1	36·8	·220	2·5	0·3	91	556	54·2	27·3	1·9	7	8	8	7	—	7·[illegible]
Lampeter	29·824	61·0	20·0	41·0	47·7	34·2	32·0	13·5	40·8	37·4	·225	2·6	0·4	88	548	66·9	—	—	6	6	10	8	—	—
Somerleyton Rectory	29·808	61·0	17·5	43·5	45·2	33·8	31·8	11·5	39·1	37·4	·225	2·6	0·2	94	557	—	24·4	1·1	6	8	8	7	5·3	6·[illegible]
Norwich	29·812	57·2	10·5	46·7	43·2	33·4	33·4	9·8	38·1	37·2	·223	2·6	0·3	97	558	—	—	—	5	10	7	7	—	—
Wisbech	29·813	59·0	11·8	47·2	45·1	34·6	33·9	10·5	39·1	35·9	·213	2·4	0·7	89	558	73·1	30·2	0·6	9	7	7	7	3·5	7·[illegible]
Llandudno	—	61·8	25·7	36·1	47·6	35·3	29·3	9·3	42·7	38·1	·231	2·7	0·5	85	551	—	—	0·9	4	8	9	9	—	7·[illegible]
Nottingham	29·810	57·2	12·0	45·2	43·0	33·8	34·2	9·2	38·4	34·8	·203	2·4	0·4	87	555	61·7	27·5	0·7	6	10	8	7	2·5	7·[illegible]
Calcethorpe	29·834	55·8	7·0	48·8	42·1	33·5	33·6	8·6	35·9	34·4	·199	2·3	0·3	88	552	72·8	30·3	1·2	7	7	8	8	6·9	7·[illegible]
Liverpool	29·786	55·4	18·0	37·4	44·4	36·3	30·2	8·1	40·1	35·6	·209	2·4	0·5	84	552	—	—	1·3	8	10	8	8	—	7·[illegible]
Eccles	29·804	57·5	12·8	44·7	45·4	34·3	34·8	11·1	39·9	35·7	·210	2·4	0·5	85	554	49·9	28·1	0·3	5	9	9	7	2·6	7·1
Moorside, Halifax	29·788	54·6	12·0	42·6	43·6	34·5	31·8	9·1	37·6	34·5	·201	2·4	0·3	89	550	58·1	31·2	0·9	5	10	6	9	2·1	8·6
Bermerside „	29·823	55·3	12·5	42·8	42·1	34·3	32·2	7·8	37·7	35·0	·205	2·4	0·3	91	549	62·8	31·6	0·6	6	8	6	10	—	8·[illegible]
Hull	29·823	58·0	12·0	46·0	43·5	33·1	35·7	10·4	37·9	34·2	·198	2·3	0·4	86	559	55·2	32·0	—	—	—	—	—	1·9	—
Stonyhurst	29·782	57·2	24·0	33·2	44·9	35·2	29·5	9·7	39·6	36·0	·213	2·5	0·4	87	549	74·7	32·6	—	6	10	7	7	—	8·4
Bradford	29·819	57·2	13·0	44·2	44·2	35·1	30·6	9·1	39·0	35·3	·210	2·4	0·4	87	550	51·3	—	1·3	6	8	7	10	—	8·3
Leeds	29·825	57·0	12·0	45·0	45·0	34·6	33·0	10·4	39·9	34·6	·204	2·4	0·5	82	555	52·6	—	1·0	6	7	8	9	—	8·6
Cockermouth	29·767	54·6	20·5	34·1	45·3	35·6	30·2	9·7	40·4	36·5	·217	2·5	0·5	87	553	64·1	27·1	0·6	5	7	11	6	2·5	7·0
Allenheads	—	58·5	16·0	42·5	40·2	30·2	32·2	10·0	34·4	—	—	—	—	—	—	65·6	29·4	1·6	6	7	9	8	—	7·5
Silloth	29·765	59·0	11·3	47·7	46·2	35·0	34·9	11·2	40·0	36·2	·214	2·5	0·5	87	555	65·9	32·1	1·5	7	9	5	9	9·2	6·7
Carlisle	29·800	56·1	20·1	36·0	43·9	34·4	31·1	9·5	39·1	35·0	·205	2·4	0·4	86	555	60·1	29·3	2·0	5	9	9	8	6·7	7·4
Bywell	29·774	57·0	10·0	47·0	45·3	35·4	34·3	9·9	39·7	33·2	·189	2·3	0·6	78	554	50·4	29·7	1·4	5	8	6	11	—	6·6
North Shields	29·826	54·3	11·2	43·1	43·6	34·9	30·2	8·7	38·9	33·9	·198	2·3	0·4	83	556	—	33·6	1·5	8	5	7	10	—	7·4
Miltown (Ireland)	—	55·0	24·0	31·0	46·4	36·0	29·3	10·4	41·2	37·8	·228	2·7	0·4	88	548	66·3	32·2	2·0	7	7	10	5	—	6·0

The highest temperatures of the air were at Helston, 64°·0 and Llandudno, 61°·8.
The lowest temperatures of the air were at Calcethorpe, 7°·0; and Royston, 8°·7.
The greatest daily ranges of the temperatures of the air were at Salisbury, 15°·3; and Lampeter, 13°·5.
The least daily ranges of the temperatures of the air were at Guernsey, 7°·6; and Bermerside Observatory, 7°·8.
The greatest numbers of rainy days were at Nottingham, 63; and Stonyhurst, 61.
The least numbers of rainy days were at Taunton, 34; and Bournemouth and Aldershot Camp, 36.
The heaviest falls of rain were at Truro, 11·83 inches; and Helston, 10·47 inches.
The least falls of rain were at Royston, 3·31 inches; and Somerleyton, 3·52 inches.

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°							
Guernsey	29·790	58·5	27·0	31·5	47·3	39·7	25·0	7·6	43·0	40·0	·251	2·9	0·4	90	549	—	—	1·5	8	8	8	7	4·5	6·[illegible]
Between the latitudes 50° and 51°	29·786	57·8	25·9	31·9	47·6	37·6	27·4	10·0	42·0	38·2	·234	2·7	0·5	86	552	63·0	35·8	1·7	8	8	7	7	—	6·[illegible]
51° and 52°	29·814	58·3	17·2	41·1	46·1	35·1	32·2	11·0	40·4	36·9	·223	2·6	0·4	88	553	65·6	31·9	1·0	7	8	7	9	2·5	7·[illegible]
52° and 53°	29·822	59·2	14·4	44·8	45·3	34·3	33·9	11·0	39·5	36·5	·217	2·6	0·4	89	555	64·0	27·4	1·0	6	8	9	8	3·8	7·[illegible]
53° and 54°	29·809	56·4	13·7	42·7	43·9	34·5	32·4	9·4	38·6	35·0	·205	2·4	0·4	87	552	59·7	31·0	0·9	6	9	7	8	3·4	8·[illegible]
54° and 55°	29·777	57·0	15·5	41·5	44·2	34·1	32·5	10·1	38·7	35·2	·206	2·4	0·5	85	554	61·2	29·5	1·4	6	8	8	8	6·1	7·[illegible]
North Shields	29·826	54·3	11·2	43·1	43·6	34·9	30·2	8·7	38·9	33·9	·198	2·3	0·4	83	556	—	33·6	1·5	8	5	7	10	—	7·[illegible]
Miltown, Banbridge (Ireland)	—	55·0	24·0	31·0	46·4	36·0	29·3	10·4	41·2	37·8	·228	2·7	0·4	88	548	66·3	32·2	2·0	7	7	10	5	—	6·[illegible]
Mean for the Quarter, 50° to 55° Year 1872	29·454	61·2	25·2	36·0	49·3	38·0	28·7	11·3	43·5	39·4	·243	2·8	0·5	87	541	69·6	22·6	1·0	4	5	13	9	4·5	6·[illegible]
„ 1873	29·650	63·3	20·5	42·8	45·7	34·7	31·1	11·0	39·8	35·9	·216	2·5	0·4	86	551	67·4	29·6	1·1	7	7	8	8	4·0	7·[illegible]
„ 1874	29·812	61·3	20·1	41·2	48·2	35·9	32·0	12·3	41·9	37·8	·228	2·6	0·4	86	551	68·6	30·6	1·2	6	4	8	13	4·1	6·[illegible]
„ 1875	29·802	57·7	17·3	40·4	45·4	35·1	31·7	10·3	39·8	36·4	·217	2·5	0·4	87	553	62·7	31·1	1·4	7	8	7	8	3·9	7·[illegible]

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING JUNE 30, 1875.

Remarks on the Weather during the Quarter ending June 30th, 1875.

By James Glaisher, Esq., F.R.S., *&c.*

In April, the weather was mild till the 6th, when the temperature descended below its average, and it was cold with the exception of the 4 days 18th to 21st, till the 26th; the average deficiency of mean temperature from the 1st to the 26th was 1°½. Vegetation, up to this time, was between 2 and 3 weeks late. On the 27th a warm period set in and continued, with few exceptions, throughout the whole month of May, which was fine and dry, till the 10th of June; the average excess of mean temperature for these 45 days was 3° daily; vegetation at this time, which had made great progress in May, was as forward on the 10th of June as in the average of seasons. From the 11th of June to the end of the quarter, the weather was cold; the deficiency on the average was 2°¾ daily.

The readings of the barometer at 160 feet above the level of the sea were above their averages on the 1st, 2nd, and 3rd of April (that for the 1st being as much as 0·61 in. in excess); they were below from the 4th to the 8th, above from the 9th to the 20th, a little below on the 21st and 22nd, above from the 23rd to the end of the month. The highest reading in the month was 30·36 ins. on the 1st, and the lowest 29·14 ins. on the 5th. In May the readings of the barometer were above their respective averages, from the 2nd to the 5th (that of the 1st was 0·04 in. below); below for the 6th, 7th, and 8th; above from the 9th to the 17th; below from the 18th to the 22nd; above from the 23rd to the 27th; and below to the end of the month, with the exception of the last day, which was 0·09 in. above. The maximum reading in the month was 30·24 ins. on the 11th, and the minimum was 29·42 ins. on the 18th. From the 1st to the 8th of June the readings of the barometer were alternately above and below their averages, but only to small amounts; they were below from the 9th to the 17th; above on the 18th and 19th; below on the 20th and 21st; above on the four following days, and then below to the end of the month. The highest reading in the month was 30·02 ins. on the 24th, the lowest was 29·32 ins. on the 15th.

The mean temperature of April was 6°·1 higher than in March, that of May was 8°·7 higher than in April; and that of June was 3°·9 higher than in May. (From the preceding 34 years' observations the mean temperature of April is higher than that of March by 5°·5; that of May is 5°·6 higher than in April; and that of June is 6°·1 higher than in May).

The mean temperature of April above that of March over the whole country was 5°·7; that of May above that of April was 7°·2; and that of June above that of May was 3°·3.

The mean temperature of the air for April was 46°·3, being 0°·2 higher than the average of the preceding 104 years; and 0°·9 below the average of the preceding 34 years, it was 3°·7 lower than the value in the year 1874, and 0°·4 higher than in the year 1873.

The mean temperature of the air for May was 55°·0, being respectively 2°·5 and 2°·2 higher than the average of the preceding 104 years and 34 years; it was higher than the corresponding values in 1874 and 1873 by 4°·5 and 4°·4 respectively.

The mean temperature of June was 58°·9, being 0°·7 higher than the average of the preceding 104 years, and the same as the average of the preceding 34 years; it was 0°·9 higher than the value in 1874; and the same as in the year 1873.

The mean high day temperatures of the air were 0°·6 and 1°·6 lower than their respective averages in April and June, but 0°·2 higher in May.

The mean low night temperatures of the air were 0°·1, 6°·1, and 1°·8 higher than their respective averages in April, May, and June.

Thus the days and nights of April and June were warm, but in May they were somewhat cold.

The mean daily ranges of temperature were 1°·4 and 1°·0 higher than their respective averages in April and June, but 0°·6 lower in May.

The average duration of the different directions of the wind referred to eight points of the compass, and the duration of each direction in each month in the quarter, were as follows:—

Direction of Wind.	April.			May.			June.		
	Average.	1875.	Departure from Average.	Average.	1875.	Departure from Average.	Average.	1875.	Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	2¼	1	−1¼	1¾	4	+2¼	2	1	−1
N.	4	2	−2	4¼	3	−1¼	3½	1	−2½
N.E.	6	8	+2	7	2	−5	3½	1	−2½
E.	3½	7	+3½	2½	2	− ½	2¼	2	− ¼
S.E.	2	1	−1	1½	2	+ ½	1¾	2	+ ¼
S.	2½	2	− ½	2¾	4	+1¼	2	4	+2
S.W.	6¼	5	−1¼	7½	8	+ ½	10	10	0
W.	2½	4	+1½	2	6	+4	3½	8	+4½
Calm, nearly.	1	0	−1	2	0	−2	1¼	1	− ¼

The + signs denote excesses over averages; in the month of April the largest with + signs are opposite the N.E. and E. winds, which were the prevalent winds during this month; in May the + signs indicating the prevailing winds are opposite to N.W., the S., and W.; and in June to the S. and W. winds.

The − signs denote defect below averages; in April the largest numbers are opposite to the *N., S.E., and S.W. winds*; in May to the N. and N.E. winds; and in June to N. and N.E. winds.

At about London the decrease of atmospheric pressure from March to April was 0·112 in., from April to May was 0·033 in., and from May to June was 0·066 in. Over the whole country it was 0·107 in. from March to April, from April to May there was a small increase at Guernsey, and in Cornwall and Devonshire, then a small decrease at southern stations gradually increasing going northwards to fully 0·1 in. at extreme northern stations; the average for the whole country was a decrease of 0·054 in.; and from May to June there was a decrease everywhere, and of nearly the same amount, its average was 0·095 in.

The fall of rain in the three months was 5·4 ins.; in April there was a small deficiency; in May there was also a deficiency, both months were dry; in June the first 10 days were almost without rain, these were followed by several days rain, and at the end of the month the fall of rain exceeded the average by about ½ of an inch. On June 29th, at Cardington, 2½ ins. fell within an hour, and Mr. Whitbread remarks that such a fall had not been experienced for more than 30 years; it fell during a thunderstorm, in which two cows were killed; this storm extended to Newport Pagnell.

1875. Months.	Temperature of										Elastic Force of Vapour.		Weight of Vapour in a Cubic Foot of Air.	
	Air.			Evaporation.		Dew Point.		Air—Daily Range.		Water of the Thames.				
	Mean.	Diff. from average of 104 years.	Diff. from average of 34 years.	Mean.	Diff. from average of 34 years.	Mean.	Diff. from average of 34 years.	Mean.	Diff. from average of 34 years.		Mean.	Diff. from average of 34 years.	Mean.	Diff. from average of 34 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
April -	46·3	+0·2	−0·9	42·5	−1·6	38·2	−2·5	20·1	+1·4	48·4	0·232	−0·023	2·7	−0·2
May -	55·0	+2·5	+2·2	50·5	+1·5	46·2	+0·9	19·9	−0·6	58·6	0·312	+0·011	3·5	+0·1
June -	58·9	+0·7	0·0	53·9	−0·7	49·5	−1·2	22·1	+1·0	62·2	0·354	−0·017	4·0	−0·1
Means -	53·4	+1·1	+0·4	49·0	−0·3	44·6	−0·9	20·7	+0·6	56·4	0·299	−0·010	3·4	−0·1

1875. Months.	Degree of Humidity.		Reading of Barometer.		Weight of a Cubic Foot of Air.		Rain.		Daily Horizontal movement of the Air.	Reading of Thermometer on Grass.				
										Number of Nights it was			Lowest Reading at Night.	Highest Reading at Night.
	Mean.	Diff. from average of 34 years.	Mean.	Diff. from average of 34 years.	Mean.	Diff. from average of 34 years.	Amount.	Diff. from average of 60 years.		At or below 30°.	Between 30° and 40°.	Above 40°.		
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
April -	74	−5	29·812	+0·074	547	+4	1·6	−0·1	236	14	13	3	20·8	42·7
May -	73	−3	29·809	+0·029	532	−9	1·5	−0·6	272	1	18	12	29·3	47·8
June -	71	−3	29·743	−0·072	537	+5	2·3	+0·3	293	0	5	25	33·5	55·9
Means -	73	−4	29·798	+0·010	539	0	Sum 5·4	Sum −0·4	Mean 267	Sum 15	Sum 36	Sum 40	Lowest 20·8	Highest 55·9

Note.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the plus sign (+) signifies above the average.

Thunderstorms occurred, on the 5th of April at Stonyhurst and North Shields. On the 7th of May at Cardington, Somerleyton, and Norwich; on the 8th at North Shields; on the 17th at Strathfield Turgiss, Streatley, Leicester, and Oxford; on the 18th at Gloucester, Royston, Cardington, Wisbech, and Hull; on the 19th at Chiswick, Leicester, Royston, Cardington, and Halifax; on the 23rd at Halifax, Stonyhurst, and Leeds; and on the 28th at Salisbury, Strathfield Turgiss, Cardington, Eccles, and Stonyhurst. On the 1st of June at Guernsey; on the 2nd at Guernsey and Salisbury; on the 3rd at Oxford, Llandudno, and Eccles; on the 4th at Somerleyton and Halifax; on the 8th at Helston; on the 9th at Guernsey, Truro, Brighton, Taunton, Salisbury, Strathfield Turgiss, Weybridge Heath, Leicester, Oxford, Gloucester, Royston, Cardington, and Calcethorpe; on the 10th at Cardington, Eccles, and Stonyhurst; on the 11th at Helston, Salisbury, Strathfield Turgiss, Leicester, Cardington, Calcethorpe, and Milltown; on the 12th at Strathfield Turgiss, Oxford, and Cardington; on the 15th at Calcethorpe, Eccles, Hull, Stonyhurst, and Cockermouth; on the 16th at Cardington; on the 17th at Leicester, Gloucester, Royston, Cardington, Calcethorpe, and Halifax; on the 18th at Brighton, Hastings, and Cardington; and on the 29th at Royston, Cardington, Somerleyton, and Calcethorpe.

Thunder was heard, but lightning was not seen, on the 5th of April at Halifax and Bywell. On the 6th of May at Calcethorpe, Bywell, and North Shields; on the 8th at Hastings; on the 18th at Salisbury and Calcethorpe; on the 19th at Osborne, Salisbury, Oxford, Eccles, and Hull; on the 23rd at Calcethorpe, Eccles, and Hull; on the 27th at Streatley; on the 28th at Taunton, Oxford, Royston, and Liverpool. On the 3rd of June at Strathfield Turgiss, Weybridge Heath, Streatley, Gloucester, Royston, and Cardington; on the 4th at Weybridge Heath, Royston, Cardington, Calcethorpe, and Hull; on the 9th at Osborne, Taunton, Aldershot Camp, Oxford, and Wisbech; on the 10th at Gloucester, Calcethorpe, Halifax, and Hull; on the 11th at Gloucester, Royston, Somerleyton, Halifax, and Stonyhurst; on the 12th at Eccles, Halifax, Hull, Allenheads, and Carlisle; on the 15th at Streatley and Gloucester; on the 16th at Somerleyton, Norwich, Hull, and Cockermouth; on the 17th at Aldershot Camp, Streatley, Oxford, Somerleyton, Halifax, and Hull; on the 18th at Osborne, Weybridge Heath, Royston, Somerleyton, and Hull; on the 21st

at Calcethorpe; on the 25th at Streatley; on the 26th at Carlisle; on the 28th at Hull; and on the 29th at Leicester and Oxford.

Lightning was seen, but thunder was not heard, on the 30th of April at Guernsey. On the 21st of May at Hastings. On the 2nd of June at Brighton and Hastings; on the 3rd at Oxford and Halifax; on the 11th at Helston and Somerleyton; on the 12th at Helston; on the 13th at Allenheads; on the 17th at Weybridge Heath, Oxford, and Wisbech; and on the 26th at Allenheads.

Solar halos were seen on the 1st, 7th, 14th, and 16th of April at Halifax; on the 17th at Oxford and Wisbech; on the 26th at Brighton, Strathfield Turgiss, Weybridge Heath, Oxford, and Wisbech; on the 27th at Brighton, Hastings, and Strathfield Turgiss; and on the 28th at Brighton, Hastings, and Oxford. On the 17th of May at Halifax; and on the 21st at Oxford. On the 2nd of June at Oxford; on the 5th at Helston and Brighton; on the 8th at Brighton and Oxford; on the 9th at Brighton; and on the 10th at Hull.

Lunar halos were seen on the 10th of May at Oxford; on the 11th at Brighton and Salisbury; on the 17th at Halifax; and on the 19th at Weybridge Heath and Oxford. On the 15th of June at Helston.

Auroræ boreales were seen on the 26th of April at Brighton; on the 30th at Streatley.

Snow fell on the 4th and 5th of April at Allenheads; on the 7th at Royston; and on the 22nd at Oxford.

Hail fell on the 5th of April at Truro, Liverpool, Eccles, and Halifax; on the 6th at Helston, Salisbury, Strathfield Turgiss, Oxford, Royston, Calcethorpe, and Halifax; on the 7th at Salisbury, on the 8th at Osborne and Silloth; and on the 22nd at Oxford and Gloucester. On the 7th of May at Cardington; on the 18th at Guernsey, Salisbury, Royston, Eccles, Cockermouth, and Allenheads; on the 19th at Osborne, Hastings, Taunton, Salisbury, Streatley, Leicester, Oxford, Royston, Cardington, Wisbech, Halifax, Stonyhurst, Allenheads, Bywell, and North Shields; on the 20th at Carlisle; on the 22nd at Halifax; on the 23rd at Wisbech, Eccles, Halifax, Hull, Stonyhurst, and Silloth; and on the 28th at Eccles. On the 10th of June at Aldershot Camp, Leicester, and Halifax; on the 11th at Salisbury, Leicester, Cardington, and Halifax; on the 12th at Weybridge Heath, Stonyhurst, Allenheads, and Carlisle; on the 13th at Allenheads; on the 15th at Eccles; on the 17th at Cardington and Cockermouth; on the 18th at Streatley; and on the 21st at Hull.

Fog prevailed on the 2nd of April at Taunton; on the 8th and 9th at Calcethorpe and Allenheads; on the 10th at Allenheads; on the 11th at Norwich, Calcethorpe, and Allenheads; on the 12th at Allenheads and Miltown; on the 14th at Aldershot Camp, Oxford, and Liverpool; on the 15th at Taunton; on the 16th at Calcethorpe and Liverpool; on the 17th at Calcethorpe and Liverpool; on the 18th at Liverpool and Hull; on the 19th at Hull; on the 27th at Guernsey; and on the 28th at Guernsey and Strathfield Turgiss. On the 1st and 2nd of May at Calcethorpe; on the 3rd and 4th at Hull; on the 5th and 8th at Hastings; on the 11th at Allenheads; on the 14th at Liverpool and Stonyhurst; on the 28th at Allenheads; and on the 30th at Eccles. On the 4th of June at Eccles; on the 19th at Helston and Weybridge Heath; on the 22nd at Helston; on the 25th at Weybridge Heath; on the 28th and 29th at Allenheads; and on the 30th at Helston and Allenheads.

Field elm in leaf,	the earliest	April 14, at Carlisle,	the latest	May 20, at Guernsey.
Wych elm in leaf,	,,	,, 12, at Carlisle,	,,	,, 18, at Hull.
Oak in leaf,	,,	,, 25, at Strathfield,	,,	,, 21, at Helston.
Lime in leaf,	,,	,, 13, at Carlisle,	,,	,, 10, at Hull & Milltown.
Sycamore in leaf,	,,	,, 2, at Helston,	,,	,, 10, at Calcethorpe.
Horse chestnut in leaf,	,,	,, 7, at Carlisle,	,,	,, 8, at Hull.
Common poplar in leaf,	,,	,, 24, at Oxford,	,,	,, 26, at Hull.
Hawthorn in leaf,	,,	,, 6, at Calcethorpe,	,,	,, 1, at Hull.
Hawthorn in blossom,	,,	,, 27, at Helston,	,,	,, 17, at Calcethorpe.
Hazel in leaf,	,,	,, 30, at Milltown,	,,	,, 16, at Hull.
Walnut in leaf,	,,	May 25, at Milltown,	,,	June 7, at Hull.
Apple in blossom,	,,	April 25, at Helston,	,,	May 11, at Allenheads.
Pear in blossom,	,,	,, 10, at Milltown,	,,	April 25, at Stonyhurst.
Cherry in blossom,	,,	,, 10, at Bywell,	,,	May 4, at Allenheads.
Plum in blossom,	,,	,, 1, at Milltown,	,,	,, 1, at Hull.
Lilac in blossom,	,,	,, 21, at Taunton,	,,	,, 31, at Allenheads.
Privet in blossom,	,,	June 18, at Llandudno,	,,	June 30, at Hull.
Honeysuckle in blossom,	,,	May 13, at Llandudno,	,,	,, 19, at Hull.
Mountain ash in blossom,	,,	,, 8, at Carlisle,	,,	May 22, at Milltown.
Syringa in blossom,	,,	,, 22, at Oxford,	,,	June 4, at Calcethorpe.
Laburnum in blossom,	,,	,, 7, at Llandudno,	,,	May 20, at Milltown.
Acacia in blossom,	,,	June 4, at Wisbech,	,,	June 19, at Hull.
Yellow broom in blossom,	,,	April 20, at Taunton,	,,	May 4, at Hull.
Wheat in flower,	,,	June 15, at Cardington,	,,	June 24, at Silloth.
Wheat in ear,	,,	,, 4, at Calcethorpe,	,,	,, 20, at Cockermouth.
Barley in flower,	,,	,, 16, at Llandudno,	,,	,, 18, at Cardington.
Barley in ear,	,,	,, 10, at Calcethorpe,	,,	,, 16, at Llandudno.
Oats in ear,	,,	,, 23, at Calcethorpe,	,,	,, 30, at Cockermouth.
Cuckoo arrived,	,,	April 8, at Helston,	,,	May 4, at Allenheads.
Swallow arrived,	,,	,, 9, at Helston,	,,	,, 2, at Stonyhurst.
Nightingale arrived,	,,	,, 17, at Oxford,	,,	April 28, at Taunton.

Cuckoo departed from Hull on the 27th of June.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING JUNE 30TH, 1875.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1875. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, SAMUEL ELLIOTT HOSKINS, Esq., M.D., F.R.S., F.M.S.	204	April	29·818	1·146	69·0	38·5	30·5	53·0	42·7	10·3	46·1	42·0	·263	3·1	0·5	87	546	—	—	1·2	10	10	5	5	3·9	3·6	8	0·95
		May	29·829	0·860	70·5	44·0	26·5	60·3	48·7	11·6	52·8	48·8	·340	3·9	0·5	87	539	—	—	1·3	8	7	8	8	4·0	3·5	12	1·50
		June	29·738	0·674	66·5	48·0	18·5	62·1	51·2	10·9	54·5	51·9	·387	4·4	0·3	92	535	—	—	1·4	6	2	9	13	4·7	4·6	17	2·59
HELSTON (Cornwall), MATTHEW P. MOYLE, Esq., M.R.C.S.	106	April	29·847	1·207	68·0	32·0	36·0	57·5	41·8	15·7	48·3	41·5	·262	3·2	1·0	77	542	84·4	37·7	2·3	6	14	5	5	4·5	4·8	11	3·07
		May	29·902	0·916	79·0	40·0	39·0	65·1	46·0	19·1	54·7	46·5	·317	3·7	1·5	71	531	99·1	43·0	2·0	7	5	10	9	3·7	4·0	15	2·28
		June	29·865	0·816	77·0	44·0	33·0	66·9	50·7	16·2	56·9	44·7	·296	3·5	2·0	63	531	91·1	48·1	2·2	5	2	10	13	3·5	5·2	20	3·36
TRURO (Cornwall), C. BARHAM, Esq., M.D., F.M.S.	43	April	29·893	1·298	67·0	29·0	38·0	54·0	40·6	15·4	46·5	41·1	·250	3·0	0·7	82	549	—	—	2·4	7	15	2	6	—	6·4	11	1·94
		May	29·884	0·912	76·0	37·0	39·0	63·4	46·5	16·9	53·4	46·0	·310	3·5	1·0	76	541	—	—	2·6	8	5	7	11	—	5·7	14	2·35
		June	29·916	0·802	76·0	41·0	35·0	65·2	52·0	13·2	55·9	50·3	·356	4·1	0·9	82	537	—	—	2·6	5	8	6	16	—	6·9	19	2·56
EASTBOURNE (Sussex), Miss W. L. HALL.	12	Jan.	29·906	1·278	52·0	26·0	26·0	48·5	40·6	7·9	45·0	41·8	·265	3·0	0·5	89	549	66·7	36·4	0·6	2	2	11	16	2·6	—	20	4·10
		Feb.	29·977	1·350	52·5	22·1	30·4	42·3	32·0	10·3	37·0	33·8	·194	2·2	0·4	89	560	72·6	23·0	0·3	10	9	4	5	0·9	—	12	1·32
		Mar.	30·162	0·910	57·8	26·8	31·0	48·0	35·6	12·4	41·6	36·7	·217	2·6	0·4	84	556	87·6	30·6	0·5	9	13	2	7	1·2	—	6	0·85
		April	29·968	1·179	71·8	29·4	42·4	57·3	37·4	19·9	46·6	41·3	·259	3·2	0·4	83	548	104·9	32·7	0·2	4	12	8	6	1·0	—	9	1·48
		May	29·932	0·812	77·9	36·7	41·2	65·9	46·5	19·4	55·3	48·3	·338	3·8	1·1	77	538	116·2	41·3	0·9	7	4	9	11	2·7	—	4	0·93
		June	29·821	0·614	78·2	42·0	36·2	68·7	50·3	18·4	58·7	53·2	·404	4·5	0·9	82	532	121·3	45·2	—	2	2	12	14	3·9	—	13	2·41
OSBORNE (Isle of Wight), J. R. MANN, Esq.	172	April	29·830	1·250	72·6	30·1	42·5	57·2	38·1	19·1	46·4	42·8	·274	3·2	0·5	87	546	96·5	34·4	0·0	4	14	7	5	—	4·4	10	1·07
		May	29·811	0·856	79·2	38·9	40·3	66·2	45·7	20·5	54·6	52·4	·394	4·5	0·3	92	537	104·5	42·8	0·2	5	5	10	11	—	4·2	11	1·21
		June	29·736	0·914	81·1	44·0	37·1	68·7	50·2	18·5	57·5	52·2	·354	4·4	1·1	84	532	106·0	47·9	0·3	3	2	12	13	—	5·6	13	1·97
BRIGHTON (Sussex), FREDERICK E. SAWYER, Esq., F.M.S.	200	Jan.	29·755	1·431	49·8	24·2	25·6	46·6	40·4	6·2	43·6	42·1	·268	3·1	0·3	92	557	—	37·4	1·0	2	3	14	12	—	8·8	21	3·69
		Feb.	29·812	1·238	47·6	24·0	23·6	39·8	31·3	8·5	35·8	33·3	·191	2·5	0·3	91	558	—	28·5	0·7	10	9	4	5	—	6·8	12	1·94
		Mar.	29·917	0·854	56·4	27·4	29·0	45·8	35·6	10·2	40·1	34·8	·202	2·1	0·8	82	554	—	31·5	0·9	12	10	1	8	—	7·6	7	0·76
		April	29·870	1·201	69·8	32·0	37·8	52·9	39·9	13·0	45·9	37·2	·223	2·6	1·0	71	547	—	35·9	1·0	5	10	8	7	—	6·0	9	1·12
		May	29·829	0·840	71·8	40·7	31·1	62·9	48·0	14·9	54·4	46·3	·313	3·5	1·2	74	537	110·2	45·0	0·9	5	3	11	12	—	5·7	8	1·13
		June	29·719	0·666	74·4	47·1	27·3	67·6	52·2	15·4	58·7	50·7	·371	4·2	1·4	75	530	112·1	49·6	1·2	4	1	11	14	—	7·5	12	3·08
MANOR HOUSE (Hastings), ALEX. E. MURRAY, Esq., F.M.S.	167	April	29·863	1·182	68·0	33·0	35·0	52·5	40·2	12·3	45·5	37·8	·224	2·6	0·9	74	548	—	—	1·7	8	11	5	6	—	5·0	9	1·19
		May	29·830	0·834	71·2	38·8	32·4	60·4	47·3	13·1	52·7	46·1	·312	3·5	1·0	79	539	—	—	1·6	7	5	11	8	—	5·0	7	0·97
		June	29·761	0·654	77·1	46·9	30·2	64·0	52·2	11·8	56·9	50·7	·370	4·1	1·1	80	533	—	—	1·7	4	4	12	10	—	5·7	13	1·67
TAUNTON (Somerset), JAMES BOTTOMLEY, Esq.	80	April	29·991	1·360	77·0	27·2	49·8	58·4	36·9	21·5	45·8	41·9	·266	3·0	0·5	86	549	68·4	35·0	0·6	2	13	8	7	4·5	5·5	10	1·15
		May	29·952	0·918	81·7	37·5	44·2	64·2	43·4	20·8	53·3	48·7	·343	3·9	0·7	81	540	79·1	43·2	0·4	7	7	7	10	5·0	5·4	13	2·64
		June	29·852	0·838	87·8	40·1	47·7	69·1	49·0	20·1	57·1	50·0	·359	4·0	1·2	77	534	89·0	45·3	0·4	6	3	3	18	5·4	7·4	13	2·38
WILTON HOUSE (near Salisbury), T. CHALLIS, Esq.	186	April	29·855	1·304	76·5	26·0	50·5	60·0	33·8	26·2	46·0	38·9	·239	2·7	0·9	77	547	106·0	30·0	1·4	5	13	4	8	3·0	5·2	10	1·54
		May	29·817	0·804	83·0	26·0	57·0	67·7	41·3	26·4	53·4	47·2	·324	3·7	0·9	79	538	113·5	37·1	1·5	8	5	5	15	3·5	6·0	12	1·69
		June	29·722	0·782	81·0	40·0	41·0	70·9	47·2	23·7	57·3	51·8	·383	4·3	0·9	82	531	118·5	44·7	1·7	5	3	6	16	4·8	6·6	15	2·99
BARNSTAPLE (Devon), T. MACKRELL, Esq.	43	April	29·994	1·370	74·0	35·0	39·0	59·5	44·6	14·9	50·2	42·2	·238	3·1	1·2	75	545	—	—	1·2	5	11	9	5	—	4·6	11	2·16
		May	29·962	0·940	79·0	41·5	37·5	66·0	49·0	17·0	55·8	47·8	·333	3·8	1·1	75	538	—	—	1·4	6	4	10	11	—	4·2	14	2·61
		June	29·876	0·800	80·0	44·0	36·0	67·8	53·3	14·5	58·4	51·9	·388	4·3	1·2	79	533	—	—	1·3	2	3	11	14	—	4·0	19	4·01
ALDERSHOT CAMP (Hants), JOHN ARNOLD, Esq., M.S.C., F.M.S.	325	April	29·687	1·270	73·2	27·4	45·8	58·6	37·3	21·3	46·2	38·6	·237	2·7	0·9	75	544	109·0	32·1	1·5	8	10	6	6	1·6	6·1	10	1·64
		May	29·652	0·900	81·4	36·6	44·8	67·4	45·2	22·2	55·1	46·1	·309	3·6	1·8	72	533	122·0	38·0	1·5	8	3	9	11	1·6	5·8	12	1·65
		June	29·548	0·760	85·4	41·6	43·6	70·7	48·9	21·8	57·4	51·7	·382	4·3	0·9	81	530	124·2	40·4	1·6	6	1	9	15	1·9	7·1	13	2·55

Names of Stations and Observers.	Height of S above Sea Level.	Months.	Mean.	Range.	Highest.	Lowest.	Range.	Of all Highest.	Of all Lowest.	Daily Range.	Air.	Dew Point.	Elastic Force.	Mean. (foot of Air)	Short of Saturation.	Mean Degree of Humidity (Satn. = 1)	Mean Weight cubic foot of Air	Maximum in Rays of Sun.	Minimum on Grass.	Estimated Strength.	N. (Relative Proportion of)	E.	S.	W.	Mean Amount Ozone.	Mean Amount Cloud.	Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
STRATHFIELD TURGISS (Hants), Rev. C. H. Griffith, M.A., F.M.S.	197	April	29·845	1·295	72·9	27·3	45·6	57·6	36·1	21·5	45·9	57·7	·226	2·6	0·8	73	547	102·0	31·8	0·5	8	10	7	5	4·0	4·5	11	1·35
		May	29·812	0·867	79·4	34·7	44·7	65·4	44·2	21·2	54·4	46·9	·322	3·6	1·1	76	537	114·6	39·0	0·5	6	4	8	13	4·5	4·9	10	1·43
		June	29·722	0·777	82·7	40·9	41·8	68·3	52·0	16·3	58·5	51·3	·378	4·3	1·1	77	531	124·1	45·1	0·6	4	2	10	14	5·5	6·7	13	3·04
WEYBRIDGE HEATH (Surrey), William F. Harrison, Esq., F.M.S.	150	April	29·898	1·270	76·8	27·0	49·8	58·8	36·3	22·5	46·6	39·1	·259	2·8	0·9	76	547	93·1	34·1	0·7	10	10	7	3	0·9	5·9	10	1·65
		May	29·887	0·869	84·0	34·5	49·5	67·6	43·7	23·9	55·0	51·1	·375	4·2	0·7	87	537	106·0	39·5	0·8	6	7	12	6	1·1	4·6	8	1·31
		June	29·793	0·726	85·5	40·8	44·7	71·6	48·0	23·6	58·2	51·4	·380	4·3	1·2	79	532	113·3	45·9	0·8	5	5	11	9	1·0	5·4	14	2·74
MARLBOROUGH, GREEN, (Wilts), Rev. Thomas A. Preston, M.A., F.M.S.	474	April	29·535	1·324	71·0	28·5	42·5	55·7	37·1	18·6	45·7	38·6	·235	2·7	0·7	77	542	101·2	32·9	0·5	7	13	4	6	—	4·7	11	1·64
		May	29·511	0·910	79·2	38·0	41·2	63·4	44·5	18·9	52·8	45·8	·309	3·6	0·9	78	533	115·8	40·3	0·5	5	4	8	14	—	5·4	13	2·51
		June	29·416	0·820	79·9	40·5	39·4	67·0	48·9	18·1	55·6	52·5	·396	4·4	0·5	89	528	119·8	45·5	0·5	4	3	7	6	—	6·0	19	2·78
BLACKHEATH (London), James Glaisher, Esq., F.R.S.	160	April	29·860	1·271	72·0	30·0	42·0	57·3	39·4	17·9	46·8	42·8	·275	3·2	0·5	87	546	105·1	35·9	0·7	6	12	5	7	—	5·2	9	1·54
		May	29·836	0·850	81·8	41·0	40·8	64·7	50·0	14·7	55·3	48·8	·346	3·9	1·1	85	536	115·2	43·8	1·0	6	4	9	12	—	5·3	13	1·44
		June	29·735	0·739	81·1	45·1	36·0	69·4	51·8	17·6	59·0	50·1	·363	4·1	1·5	73	530	122·2	48·0	1·4	2	4	10	14	—	6·2	12	2·15
STREATLEY VICARAGE (Berks), Rev. J. Slatter, M.A., F.R.A.S., F.M.S.	150	April	29·898	1·191	75·3	28·4	46·9	57·8	37·0	20·8	46·8	37·7	·226	2·7	1·0	71	547	66·9	—	1·0	9	12	3	6	—	5·3	10	1·50
		May	29·859	0·816	82·5	37·9	44·6	66·7	43·6	23·1	54·5	46·4	·313	3·6	1·1	74	538	76·5	—	1·8	6	4	8	13	—	6·0	13	2·40
		June	29·756	0·808	85·2	41·0	44·2	70·2	47·6	22·6	58·0	51·2	·376	4·3	1·2	78	532	80·8	—	2·0	4	3	11	12	—	6·5	18	2·98
CAMDEN SQUARE (London), G. J. Symons, Esq., F.M.S.	123	April	29·919	1·168	74·0	29·3	44·7	53·3	38·0	20·3	47·0	38·5	·233	2·7	1·0	73	547	95·5	35·9	—	10	7	4	9	—	5·6	10	1·53
		May	29·821	0·858	78·3	39·8	38·5	67·2	46·7	20·5	55·7	46·6	·319	3·6	1·3	71	537	117·7	43·8	—	7	4	9	11	—	4·2	13	1·61
		June	29·788	0·769	85·1	43·3	41·8	72·3	50·9	21·4	59·7	50·5	·368	4·1	1·5	72	530	120·6	48·5	—	7	2	12	9	—	6·2	15	2·41
CHISWICK (Middlesex), Prof. Thiselton Dyer, M.A., B.Sc., F.L.S.	25	April	30·016	1·276	75·0	26·0	49·0	57·4	36·3	21·1	46·0	37·8	·229	2·6	1·0	74	550	107·4	31·7	1·1	7	10	7	6	—	7·0	8	1·46
		May	29·980	0·870	82·2	36·2	46·0	67·7	44·5	23·2	56·0	45·8	·309	3·4	1·6	69	538	126·5	38·9	1·4	6	4	9	12	—	6·3	10	1·18
		June	29·870	0·746	85·0	40·5	44·5	71·4	48·2	23·2	58·2	51·7	·380	4·2	1·2	78	533	132·1	44·2	1·5	4	5	9	12	—	7·3	16	1·84
TOWN MUSEUM (Leicester), W. J. Harrison, Esq.	215	April	29·779	1·406	70·5	30·0	40·5	55·1	39·3	15·8	46·4	37·4	·225	2·6	1·0	73	545	101·1	34·2	1·0	6	9	7	8	—	7·2	9	1·24
		May	29·724	0·670	73·6	38·3	35·3	63·3	45·2	18·1	53·5	40·7	·214	2·8	1·8	63	537	123·4	38·5	1·0	5	7	8	11	—	6·4	15	1·91
		June	29·613	0·931	77·7	40·6	37·1	66·5	49·5	17·0	57·1	49·2	·350	3·9	1·2	74	530	124·0	44·9	1·0	6	5	9	10	—	6·5	15	4·41
OXFORD (Oxfordshire), Rev. R. Main, M.A., F.R.S., F.R.A.S.	210	April	29·796	1·284	70·8	29·9	40·9	56·1	38·2	17·9	47·0	39·8	·245	2·8	0·9	77	545	104·4	34·4	0·7	6	11	6	7	2·7	6·3	10	1·46
		May	29·763	0·887	80·4	38·8	41·6	65·0	46·0	19·0	55·3	47·5	·330	3·7	1·2	75	535	124·9	41·1	0·9	5	4	9	13	3·7	6·1	14	1·76
		June	29·650	0·862	81·0	40·9	40·1	69·1	50·9	18·2	59·2	51·2	·378	4·3	1·4	75	528	118·4	46·7	0·9	4	3	10	13	5·6	7·4	17	2·96
GLOUCESTER (Gloucester), E. Toller, Esq., M.D.	100	April	29·974	1·378	75·1	26·5	48·6	59·0	37·7	21·3	46·9	40·3	·251	2·9	0·8	80	547	98·3	34·5	0·4	7	8	7	8	0·3	5·0	9	1·60
		May	29·938	0·961	80·4	38·1	42·3	68·2	45·4	22·8	55·3	46·2	·314	3·6	1·4	72	539	116·8	41·6	1·0	8	3	7	13	1·5	4·7	10	1·81
		June	29·848	0·898	81·5	38·4	43·1	72·7	49·4	23·3	58·7	54·3	·423	4·8	0·6	85	532	117·6	45·2	1·0	7	4	7	12	1·6	6·1	17	3·29
ROYSTON (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	April	29·782	1·291	74·0	27·1	46·9	58·7	36·5	22·2	46·2	38·9	·238	2·7	0·9	76	545	—	—	—	8	6	8	8	—	5·6	8	1·42
		May	29·753	0·879	81·6	33·9	47·7	68·0	43·7	24·3	54·3	46·5	·315	3·6	1·1	75	536	—	—	—	5	3	11	12	—	5·0	10	1·90
		June	29·649	0·774	84·9	38·4	46·5	72·6	47·9	24·7	58·3	51·4	·381	4·3	1·1	78	529	—	—	—	6	3	10	11	—	6·0	15	2·88
CARDINGTON (near Bedford), Mr. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	105	April	29·953	1·320	72·6	26·6	46·0	56·7	37·5	19·2	46·2	40·6	·233	2·9	0·8	81	548	83·1	31·8	1·6	9	8	5	8	—	6·2	6	1·74
		May	29·889	0·850	81·0	37·4	43·6	67·2	45·3	21·9	55·7	47·0	·324	3·8	1·1	73	537	100·8	38·2	2·2	5	5	7	14	—	5·4	12	2·00
		June	29·780	0·840	83·0	41·6	41·4	72·1	49·6	22·5	59·9	48·8	·345	3·8	2·0	68	530	106·2	44·8	2·7	5	5	6	14	—	5·7	16	4·66
ST. DAVID'S COLLEGE, LAMPETER (Cardiganshire), Prof. A. W. Scott.	420	April	29·606	1·484	73·0	24·0	49·0	58·8	35·4	23·4	47·0	38·5	·233	2·7	1·0	73	541	98·1	—	—	6	9	9	6	—	—	8	1·87
		May	29·551	0·972	80·0	33·0	47·0	65·2	40·6	24·6	53·0	44·4	·292	3·2	1·2	73	534	109·4	—	—	7	3	11	10	—	—	12	2·10
		June	29·483	0·948	80·5	35·0	45·5	67·4	45·4	22·0	55·3	48·1	·335	3·8	1·1	77	530	113·3	—	—	4	3	13	10	—	—	16	2·55
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	April	30·012	1·154	71·0	27·1	43·9	55·5	36·9	18·6	44·7	41·0	·257	2·9	0·4	87	551	—	27·8	1·1	8	10	7	6	6·8	5·8	7	0·69
		May	29·964	0·840	81·5	37·2	44·3	64·8	43·3	21·5	53·0	47·6	·330	3·7	0·8	82	541	—	33·9	1·4	6	8	9	8	7·5	4·1	10	1·70
		June	29·844	0·794	82·4	42·8	39·6	68·8	48·1	20·7	57·0	52·2	·391	4·4	0·8	84	531	—	40·1	1·2	4	7	11	8	7·9	4·8	17	2·16

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1875. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean. Of all Highest.	Mean. Of all Lowest.	Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	In a cubic foot of Air. Mean.	In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat^{n}. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
NORWICH (Norfolk), JOHN QUINTON, Esq., Jun.	42	April	30·000	1·266	66·5	28·5	38·0	55·5	36·8	18·7	45·1	41·4	·261	3·0	0·5	87	550	—	—	—	11	6	5	8	—	—	5	0·64
		May	29·945	0·878	80·8	38·0	42·8	64·6	44·9	19·7	53·7	50·7	·370	4·2	0·5	80	540	—	—	—	6	4	10	11	—	—	11	1·39
		June	29·847	0·822	85·0	42·0	43·0	71·0	49·2	21·8	58·8	53·5	·410	4·5	1·0	82	532	—	—	—	5	6	13	6	—	—	13	1·60
WISBECH (Cambridgeshire), S. H. MILLER, Esq., F.R.A.S., F.M.S.	14	April	30·030	1·320	73·5	30·0	43·5	58·0	38·7	19·3	46·9	40·6	·253	2·9	0·8	79	549	101·6	33·3	0·5	8	6	6	11	3·0	6·2	5	0·85
		May	29·962	0·906	81·4	39·0	42·4	67·1	44·7	22·4	55·2	47·2	·325	3·7	1·2	75	538	118·1	39·2	0·7	6	4	11	10	5·0	4·9	14	1·61
		June	29·863	0·930	85·0	42·3	42·7	73·8	49·7	24·1	60·2	52·1	·391	4·4	1·5	74	531	122·6	45·2	0·7	6	2	12	10	4·7	5·6	15	3·28
LLANDUDNO (Carnarvonshire), JAMES NICOL, Esq., M.D., and THOMAS DALTON, Esq., M.D.	100	April	29·933	1·570	70·0	35·0	35·0	56·8	42·3	14·5	48·6	39·0	·238	2·7	1·2	69	546	—	—	0·6	5	7	7	11	—	4·8	6	0·94
		May	29·853	0·938	72·9	38·5	34·4	63·1	48·0	15·1	53·9	46·2	·311	3·5	1·1	75	538	—	—	0·8	4	6	8	13	—	7·0	13	1·46
		June	29·745	1·100	74·9	45·4	29·5	65·9	51·1	14·8	57·2	50·3	·365	4·0	1·2	77	532	—	—	0·7	2	4	5	19	—	6·5	16	1·81
NOTTINGHAM (Notts), M. O. TARBOTTON, Esq., C.E., F.G.S., F.M.S.	183	April	29·840	1·422	72·2	26·8	45·4	57·0	38·3	18·7	46·4	39·4	·242	2·8	0·8	77	546	104·0	32·4	0·6	9	8	5	8	3·3	6·6	8	0·76
		May	29·771	0·866	76·5	34·2	42·3	65·3	43·8	21·5	53·2	48·5	·340	3·8	0·7	83	537	122·6	38·6	0·7	5	7	10	9	4·5	6·3	16	1·70
		June	29·666	0·926	79·2	40·3	38·9	69·0	48·6	20·4	57·4	49·5	·354	3·9	1·4	74	531	121·5	44·8	0·4	7	4	9	10	5·5	5·7	16	3·02
HOLKHAM (Norfolk), JOHN DAVIDSON, Esq., Assistant to the EARL of LEICESTER.	30	April	29·974	1·184	66·6	23·2	43·4	53·6	34·8	18·8	44·2	37·3	·222	2·6	0·6	76	551	107·1	31·5	1·5	14	4	4	8	—	5·9	6	0·85
		May	29·922	0·848	76·4	30·0	46·4	63·4	41·2	22·2	52·5	44·3	·288	3·3	1·1	73	541	122·0	37·8	1·6	10	3	10	8	—	4·8	10	1·08
		June	29·821	0·866	76·7	36·0	40·7	67·4	45·8	21·6	56·2	48·5	·343	3·8	1·2	75	535	128·7	43·7	1·6	8	5	11	6	—	6·2	13	2·02
CALCETHORPE MANOR (near) Louth (Lincolnshire), D. GRANT BRIGGS, Esq., F.M.S.	332	April	29·631	1·391	68·0	29·6	38·4	52·9	37·5	15·4	44·0	38·6	·234	2·7	0·6	81	545	101·9	31·2	0·9	8	7	9	6	6·8	6·0	9	0·73
		May	29·574	0·867	72·9	35·8	37·1	60·8	43·1	17·7	50·8	43·6	·285	3·3	0·9	77	538	119·1	38·1	0·9	4	6	11	10	6·9	5·7	15	1·44
		June	29·476	0·996	76·0	40·1	35·9	64·5	47·2	17·3	54·7	47·1	·324	3·7	1·2	75	531	123·4	44·1	1·0	5	4	11	10	6·0	6·2	17	3·14
LIVERPOOL OBSERVATORY, JOHN HARTNUP, Esq., F.R.A.S.	197	April	29·824	1·572	70·2	33·8	36·4	54·4	41·6	12·8	47·0	37·2	·222	2·6	1·2	69	545	—	—	1·0	3	10	9	8	—	4·8	7	0·59
		May	29·746	0·908	74·0	42·5	31·5	59·9	47·5	12·4	52·4	44·3	·292	3·4	1·0	74	539	—	—	1·4	3	6	6	16	—	5·5	16	1·93
		June	29·646	1·127	78·0	44·6	33·4	63·4	50·7	12·7	55·5	46·9	·322	3·8	1·1	73	533	—	—	1·2	2	5	9	14	—	6·0	16	2·10
ECCLES (near MANCHESTER), T. MACKERETH, Esq., F.R.A.S., F.M.S.	145	April	29·885	1·496	74·5	28·0	46·5	58·0	38·5	19·5	47·3	39·0	·327	2·8	1·0	74	546	71·8	31·8	0·5	6	9	6	9	2·7	6·4	6	0·76
		May	29·814	0·858	76·7	33·0	43·7	62·5	43·5	19·0	52·3	45·5	·305	3·5	1·0	78	539	79·5	37·3	0·3	5	3	7	16	3·0	7·4	18	2·68
		June	29·714	1·086	80·4	40·0	40·4	66·0	48·2	17·8	55·9	48·7	·344	3·9	1·1	78	533	81·0	41·6	0·3	5	3	10	12	2·9	7·4	20	3·90
MOOR SIDE OBSERVATORY, HALIFAX (Yorkshire), LOUIS J. CROSSLEY, Esq., F.R.A.S.	429	April	29·528	1·506	70·5	29·6	40·9	54·5	39·2	15·3	45·4	38·7	·235	2·7	0·8	78	542	83·5	33·3	0·9	5	10	5	10	1·8	6·3	8	1·17
		May	29·469	0·922	75·4	35·0	40·4	63·1	44·8	18·3	52·3	42·3	·270	3·0	1·5	67	532	101·3	39·2	1·0	6	4	6	15	3·1	7·1	14	1·64
		June	29·414	1·123	76·8	39·2	37·6	66·5	49·1	17·4	55·7	48·5	·343	3·8	1·1	77	528	110·5	44·0	1·2	4	6	6	14	3·1	7·2	16	3·14
BERMERSIDE OBSERVATORY, HALIFAX (Yorkshire), EDWARD CROSSLEY, Esq., F.R.A.S.	520	April	29·460	1·486	72·0	29·3	42·7	54·6	37·7	16·9	45·0	37·2	·218	2·6	0·8	75	541	90·0	34·6	0·6	5	9	7	9	—	6·3	8	1·22
		May	29·428	0·830	74·0	34·0	40·0	62·4	43·1	19·3	51·3	43·5	·284	3·2	0·8	76	533	106·7	39·5	0·7	5	4	8	14	—	5·9	11	1·61
		June	29·308	1·144	78·0	38·5	39·5	66·0	46·9	19·1	54·4	48·0	·331	3·8	0·8	79	528	111·4	43·7	0·8	4	5	10	11	—	6·4	17	3·24
THE PARK, HULL (Yorkshire), MR. E. PEAK.	12	April	30·030	1·428	70·0	26·0	44·0	55·6	37·2	18·4	45·7	40·0	·247	2·8	0·7	81	550	80·4	33·9	—	—	—	—	—	1·7	—	7	0·44
		May	29·958	0·912	76·0	35·0	41·0	64·0	43·1	20·9	52·8	46·7	·319	3·6	0·9	80	541	92·0	39·5	—	—	—	—	—	2·3	—	15	1·51
		June	29·872	1·072	78·0	38·0	40·0	68·2	47·5	20·7	56·5	48·8	·348	3·9	1·1	76	535	96·0	44·9	—	—	—	—	—	2·5	—	14	2·12
STONYHURST (Lancashire), REV. S. J. PERRY, F.R.A.S., F.M.S.	363	April	29·642	1·531	70·8	29·0	41·8	56·5	38·9	17·6	46·5	41·8	·267	3·2	0·5	85	542	108·1	36·2	—	10	6	6	8	—	6·2	8	1·59
		May	29·559	0·877	72·0	33·6	38·5	61·4	43·6	17·8	51·0	46·1	·313	3·4	0·7	84	536	116·6	41·3	—	4	5	9	13	—	7·4	25	2·92
		June	29·456	1·101	75·1	41·2	33·9	64·5	47·9	16·6	54·5	48·8	·314	3·9	0·8	81	530	117·4	46·3	—	2	4	6	18	—	7·6	20	4·47
BRADFORD (Yorkshire), J. McLANDSBOROUGH, Esq., C.E., F.G.S.	366	April	29·610	1·498	70·0	32·3	37·7	51·5	40·7	13·8	46·0	39·6	·244	2·8	0·8	79	542	73·6	—	1·1	6	8	4	12	—	6·6	6	0·70
		May	29·569	0·896	73·2	37·5	35·7	62·1	47·1	15·0	53·0	44·1	·289	3·3	1·3	72	534	90·5	—	0·9	2	5	7	17	—	7·0	11	1·22
		June	29·465	1·144	74·4	42·8	31·6	65·6	50·0	15·6	56·0	46·5	·319	3·5	1·5	70	529	93·2	—	1·0	4	6	7	13	—	6·0	13	2·14
LEEDS PHILOSOPHICAL HALL (Yorkshire), LOUIS C. MIALL, Esq.	187	April	29·882	1·360	73·0	29·0	44·0	57·2	39·5	17·7	47·3	39·9	·246	2·8	0·9	76	546	74·4	—	1·0	9	9	3	9	—	7·8	9	0·50
		May	29·797	0·822	79·0	37·0	42·0	65·3	43·4	19·9	54·5	44·5	·283	3·4	1·3	68	537	85·3	—	1·1	6	8	7	15	—	6·8	15	1·46
		June	29·704	1·136	83·0	43·0	40·0	68·5	49·2	19·3	58·0	48·9	·347	3·9	1·5	72	531	84·7	—	1·0	6	4	4	18	—	7·0	15	2·99

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1875. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. E.	Wind. S.	Wind. W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
COCKERMOUTH (Cumberland), H. DODGSON, Esq., M.D., F.R.A.S., F.M.S.	146	April	29·856	1·601	69·5	30·4	39·1	55·6	38·2	17·4	46·0	39·6	·244	2·8	0·8	79	547	93·5	32·7	0·4	5	8	6	11	1·8	4·6	9	1·51
		May	29·746	1·144	71·2	36·6	34·6	61·1	45·6	15·5	52·2	46·3	·312	3·5	0·9	81	538	107·2	38·6	0·6	4	2	11	14	2·7	6·3	18	2·53
		June	29·662	1·183	73·0	39·8	33·2	63·9	49·0	14·9	55·1	49·8	·359	4·0	0·9	82	533	110·7	42·5	0·4	3	5	13	9	2·0	6·5	16	3·54
ALLENHEADS (Northumberland), MR. T. KIDD, Assistant to W. B. BEAUMONT, Esq., M.P.	1360	April	28·598	1·526	67·0	28·0	39·0	50·8	36·1	14·7	42·0	—	—	—	—	—	—	97·1	33·4	1·2	10	5	4	11	—	6·6	10	1·71
		May	28·491	0·808	70·0	34·0	36·0	58·9	41·7	17·2	48·2	—	—	—	—	—	—	112·0	38·5	1·5	4	6	9	12	—	5·1	19	3·03
		June	28·450	1·184	71·0	36·5	34·5	62·2	43·8	18·4	51·9	—	—	—	—	—	—	118·3	40·8	1·2	3	4	16	7	—	6·4	20	2·53
SILLOTH RECTORY (Cumberland), REV. FRANCIS REDFORD, M.A., F.R.A.S., F.M.S.	28	April	29·996	1·620	70·0	29·8	40·2	57·5	38·3	19·2	46·6	39·3	·241	2·8	0·9	77	549	87·8	34·8	1·2	6	8	5	11	7·8	4·3	8	1·09
		May	29·887	0·910	76·1	36·6	39·5	64·7	45·4	19·3	53·3	46·2	·310	3·5	1·1	77	539	99·6	42·0	1·3	2	3	8	18	8·2	5·5	13	1·41
		June	29·791	1·194	76·9	41·8	35·1	67·9	48·3	19·6	56·3	49·8	·358	4·0	1·0	78	534	100·5	44·8	1·4	0	6	7	17	8·7	5·8	18	2·54
CARLISLE (Cumberland), ISAAC CARTMELL, Esq., F.M.S.	114	April	29·911	1·610	68·3	29·4	38·9	56·2	41·0	15·2	47·0	39·1	·239	2·8	0·9	75	547	86·4	32·4	1·7	9	9	2	10	5·6	6·0	8	0·75
		May	29·814	0·922	75·1	36·0	39·1	63·0	43·9	19·1	52·8	43·2	·279	3·2	1·3	70	539	97·4	37·9	2·2	3	1	9	18	7·0	6·8	16	1·53
		June	29·735	1·200	78·2	39·5	38·7	65·7	47·4	19·3	55·1	47·7	·332	3·7	1·2	76	535	98·0	42·5	1·9	2	6	7	15	6·3	7·0	19	2·31
BYWELL (Northumberland), MR. JOHN DAWSON, Assistant to W. B. BEAUMONT, Esq., M.P.	87	April	29·916	1·476	74·0	34·0	40·0	56·9	41·0	15·9	47·2	38·3	·231	2·7	1·0	72	547	74·4	35·3	1·4	6	10	4	10	—	4·4	12	1·09
		May	29·785	0·836	73·0	43·0	30·0	62·1	47·9	14·2	53·6	43·5	·283	3·2	1·2	68	537	90·3	41·9	1·4	7	3	5	16	—	3·7	14	1·21
		June	29·692	1·250	78·0	44·0	34·0	65·4	50·5	14·9	56·3	46·8	·322	3·6	1·8	71	534	95·7	44·8	1·4	3	6	7	14	—	4·5	17	2·11
NORTH SHIELDS (Northumberland), ROBERT SPENCE, Esq.	124	April	29·937	1·445	65·0	31·8	33·2	51·4	39·5	11·9	44·2	38·1	·230	2·7	0·6	79	551	—	38·1	1·7	10	6	4	10	—	6·0	9	0·76
		May	29·796	0·989	70·0	39·0	31·0	60·0	44·8	15·2	50·9	42·9	·277	3·2	1·0	75	540	—	43·5	1·4	8	4	7	12	—	5·5	16	0·72
		June	29·725	1·175	73·6	42·0	31·6	62·1	48·8	13·3	54·2	47·9	·332	3·8	1·0	79	535	—	47·3	1·2	3	9	6	12	—	7·2	16	1·57
MILLTOWN (Banbridge, Ireland), JOHN P. SMYTH, Esq., jun., M.A., M.I.C.E.I., F.G.S.	200	April	29·697	1·540	69·0	29·0	40·0	57·2	37·7	19·5	47·6	39·6	·244	2·8	0·9	75	542	104·5	32·8	1·8	8	8	9	5	—	3·6	7	0·38
		May	29·578	1·166	71·0	36·0	35·0	61·2	45·4	15·8	52·0	44·1	·289	3·3	1·1	75	535	104·6	40·5	2·0	4	3	15	9	—	5·2	20	1·47
		June	29·472	1·176	73·0	38·0	35·0	63·5	46·8	16·7	53·0	46·8	·310	3·7	0·9	77	531	102·3	42·6	1·8	4	4	16	6	—	5·9	22	3·32

NOTE.—*The Barometer Reading*, HOLKHAM, 8th April, 3h. p.m., 30·698 in., has been altered to 29·698 in.
" BARNSTAPLE, 17th May, 9h. a.m., 30·630 in., " 29·600 in.
" LLANDUDNO, 17th May, 9h. a.m., 30·750 in., " 30·150 in.

Second Rain-gauges are placed—

			April.		May.		June.		Total during the Quarter.
At Strathfield Turgiss, at the height of	38 feet	*above the ground*, the amount collected was	0·92 inches.	-	0·93 inches.	-	1·96 inches.	-	3·80 inches.
" Aldershot Camp, "	25 feet	" "	1·29 "	-	1·24 "	-	2·06 "	-	4·59 "
" Oxford, "	22 feet	" "	1·26 "	-	1·70 "	-	2·90 "	-	5·86 "
" Cardington, "	36 feet	" "	1·12 "	-	1·60 "	-	4·25 "	-	6·97 "
" Wisbech, "	8 feet	" "	0·80 "	-	1·59 "	-	3·22 "	-	5·61 "
" Nottingham, "	39 feet	" "	0·77 "	-	1·47 "	-	2·65 "	-	4·89 "
" Eccles (Manchester), "	34 feet	" "	0·54 "	-	2·35 "	-	3·33 "	-	6·22 "
" Milltown (Ireland), "	40 feet	" "	0·30 "	-	1·21 "	-	3·07 "	-	4·58 "

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°							
Guernsey	29·692	70·5	38·5	32·0	58·5	47·5	25·2	10·9	51·1	47·6	·334	3·8	0·4	89	540	—	—	1·3	8	6	7	9	4·2	3·
Helston	29·689	79·0	32·0	47·0	63·2	45·2	36·0	17·0	53·3	44·2	·292	3·5	1·5	70	536	91·5	42·9	2·5	6	7	8	9	3·9	4·
Truro	29·701	76·0	29·0	47·0	61·5	46·4	37·3	15·2	51·9	45·8	·312	3·5	0·9	80	542	—	—	2·5	7	[illegible]	5	11	—	6·
Eastbourne	29·604	78·2	29·4	48·8	64·0	44·7	39·9	19·3	53·6	57·6	·334	3·8	0·8	81	539	114·1	39·7	—	4	6	10	10	2·5	—
Osborne	29·647	81·1	30·1	51·0	64·0	44·7	40·0	19·3	52·8	49·1	·353	4·0	0·6	88	538	102·3	41·7	0·2	4	7	10	10	—	4·
Brighton	29·708	74·4	32·0	42·4	61·1	46·7	32·1	14·4	53·0	44·7	·302	3·4	1·2	73	538	—	43·5	1·0	5	5	10	11	—	6·
Hastings	29·710	77·1	33·0	44·1	59·0	46·6	32·5	12·4	51·7	44·9	·302	3·4	1·0	78	540	—	—	1·7	6	7	9	8	—	5·
Taunton	29·698	87·8	27·2	60·6	63·9	43·1	47·2	20·8	52·1	46·9	·323	3·6	0·8	82	541	77·1	41·2	0·5	5	8	6	12	5·0	6·
Salisbury	29·689	83·0	26·0	57·0	66·2	40·8	49·5	25·4	52·2	46·0	·315	3·6	0·9	79	539	112·7	37·3	1·5	6	6	5	13	3·8	5·
Barnstaple	29·661	80·0	35·0	45·0	64·4	49·0	37·5	15·4	54·8	47·3	·330	3·7	1·2	76	539	—	—	1·3	4	6	10	10	—	4·
Aldershot Camp	29·667	85·4	27·4	58·0	65·6	43·8	44·7	21·8	52·9	45·5	·309	3·5	1·0	76	539	116·4	39·1	1·5	7	5	8	11	1·7	6·
Strathfield Turgiss	29·700	82·7	27·3	55·4	63·8	44·1	44·0	19·7	52·9	45·3	·309	3·5	1·0	75	538	113·6	38·6	0·5	6	5	8	11	4·7	5·
Weybridge Heath	29·694	85·5	27·0	58·5	66·0	42·7	48·0	23·3	53·3	47·2	·331	3·8	0·9	81	539	104·1	39·8	0·8	7	7	10	6	1·0	5·
Marlborough Green	29·664	79·9	28·5	51·4	62·0	43·5	41·0	18·5	51·4	45·6	·313	3·6	0·7	81	534	112·3	39·6	0·5	5	7	6	12	—	5·
Blackheath	29·658	81·8	30·0	51·8	63·8	47·1	39·6	16·7	53·7	47·2	·328	3·7	1·0	81	537	114·2	42·6	1·0	5	7	8	11	—	5·
Streatley Vicarage	29·699	85·2	28·4	56·8	64·9	42·7	45·2	22·2	53·1	45·1	·305	3·5	1·1	74	539	74·7	—	1·6	6	6	7	10	—	5·
Camden Square	29·694	85·1	29·3	55·8	65·9	45·2	41·7	20·7	54·1	45·2	·307	3·5	1·3	72	538	111·3	42·7	—	8	4	8	10	—	5·
Chiswick	29·676	85·0	26·0	59·0	65·5	43·0	46·5	22·5	53·4	45·1	·306	3·4	1·3	74	540	122·0	38·0	1·3	6	6	8	10	—	6·
Leicester	29·700	77·7	30·0	47·7	61·6	44·7	37·6	16·9	52·3	42·4	·276	3·1	1·3	70	537	116·5	39·2	1·0	6	7	8	10	—	6·
Oxford	29·648	81·0	29·9	51·1	63·4	45·0	40·9	18·4	53·8	46·2	·318	3·6	1·2	76	536	115·9	40·7	0·8	5	6	8	11	3·3	6·
Gloucester	29·708	81·5	26·5	55·0	66·6	44·2	44·7	22·4	53·6	46·9	·329	3·8	0·9	79	539	110·9	40·4	0·8	7	5	7	11	1·1	5·
Royston	29·711	84·9	27·8	57·1	66·4	42·7	47·0	23·7	52·9	45·6	·311	3·5	1·0	76	537	—	—	—	6	4	10	10	—	5·
Cardington	29·680	83·0	26·6	56·4	65·3	44·1	43·7	21·2	53·9	45·5	·307	3·5	1·3	74	538	96·7	38·3	2·2	6	6	6	12	—	5·
Lampeter	29·714	80·5	24·0	56·5	63·8	40·5	40·5	23·3	51·8	43·7	·287	3·2	1·1	74	535	106·9	—	—	6	5	11	9	—	—
Somerleyton Rectory	29·670	82·4	27·1	55·3	63·0	42·8	42·6	20·2	51·6	46·9	·326	3·7	0·7	84	542	—	33·9	1·2	6	8	9	7	7·4	4·
Norwich	29·630	85·0	28·5	56·5	63·7	43·6	41·3	20·1	52·5	48·5	·347	3·9	0·7	86	541	—	—	—	7	5	9	8	—	—
Wisbech	29·644	85·0	30·0	55·0	66·3	44·4	42·9	21·9	54·1	46·6	·323	3·7	1·2	76	539	114·1	39·2	0·6	7	4	10	10	4·2	5·
Llandudno	29·649	74·9	35·0	39·9	61·9	47·1	33·0	14·8	53·2	45·2	·305	3·4	1·2	74	539	—	—	0·7	4	5	7	14	—	6·
Nottingham	29·649	79·2	26·8	52·4	63·8	43·6	42·2	20·2	52·3	45·8	·312	3·5	1·0	78	538	116·0	38·6	0·6	7	6	8	9	4·4	6·
Holkham	29·665	76·7	23·2	53·5	61·5	40·6	45·5	20·9	51·0	43·4	·284	3·2	1·0	75	542	119·3	37·7	1·6	11	4	8	7	—	5·
Calcethorpe	29·691	76·0	29·6	46·4	59·4	42·6	37·1	16·8	49·8	43·1	·281	3·2	0·9	78	538	114·8	37·8	0·9	6	6	10	9	6·6	6·
Liverpool	29·677	78·0	33·8	44·2	59·2	46·6	33·8	12·6	51·6	42·8	·279	3·3	1·1	72	539	—	—	1·2	3	7	8	13	—	5·
Eccles	29·638	80·4	28·0	52·4	62·2	43·4	45·5	18·8	51·8	44·4	·325	3·4	1·0	77	538	77·4	36·9	0·4	5	5	8	12	2·9	7·
Moorside, Halifax	29·650	76·8	29·6	47·2	61·4	44·4	39·6	17·0	51·1	43·2	·283	3·2	1·1	74	534	98·4	38·8	1·0	5	7	6	13	2·7	6·
Bermerside ,,	29·684	78·0	29·3	48·7	61·0	42·6	40·7	18·4	50·2	42·9	·279	3·2	0·8	77	534	102·7	39·3	0·7	5	6	8	11	—	6·
Hull	29·661	78·0	26·0	52·0	62·6	42·6	41·7	20·0	51·7	45·2	·305	3·4	0·9	79	542	89·5	39·4	—	—	—	—	—	2·2	—
Stonyhurst	29·634	75·1	29·0	46·1	60·8	43·5	38·1	17·3	50·7	45·6	·308	3·5	0·7	83	536	114·0	41·3	—	5	5	7	13	—	7·
Bradford	29·655	74·4	32·3	42·1	60·7	45·9	35·0	14·8	51·7	43·4	·284	3·2	1·2	74	535	85·8	—	1·0	4	6	6	14	—	6·
Cockermouth	29·612	73·0	30·4	42·6	60·2	44·3	35·6	15·9	51·1	45·2	·305	3·4	0·9	81	539	103·8	37·9	0·5	4	5	10	11	2·2	5·
Allenheads	—	71·0	28·0	43·0	57·3	40·5	36·5	16·8	47·4	—	—	—	—	—	—	109·1	37·6	1·3	6	5	10	10	—	6·
Silloth	29·619	76·9	29·8	47·1	63·4	44·0	38·3	19·4	52·1	45·1	·303	3·4	1·0	77	541	96·0	40·5	1·3	3	6	7	15	8·2	5·
Carlisle	29·612	78·2	29·4	48·8	62·0	44·1	38·9	17·9	51·6	43·3	·283	3·2	1·1	74	540	93·9	37·6	1·9	5	5	6	14	6·3	6·
North Shields	—	73·6	31·8	41·8	57·8	44·4	31·9	13·4	49·8	43·0	·280	3·2	0·9	78	542	—	43·0	1·4	7	6	6	11	—	6·
Milltown (Ireland)	—	73·0	29·0	44·0	60·6	43·3	36·7	17·3	51·2	43·5	·284	3·3	1·0	76	536	103·8	38·6	1·9	5	5	13	7	—	4·

The highest temperatures of the air were at Taunton, 87°·8; and Weybridge Heath, 85°·5.

The lowest temperatures of the air were at Holkham, 23°·2; and Lampeter, 24°·0.

The greatest daily ranges of the temperature of the air were at Salisbury, 25°·4; and Royston, 23°·7.

The least daily ranges of the temperature of the air were at Guernsey, 10°·9; and Hastings, 12°·4.

The greatest numbers of rainy days were at Stonyhurst, 53; and Allenheads and Milltown, 49.

The least numbers of rainy days were at Eastbourne, 26; and Brighton, Hastings, Norwich, and Holkham, 29.

The heaviest falls of rain were at Stonyhurst, 8·98 inches; and Barnstaple, 8·78 inches.

The least falls of rain were at North Shields, 3·05 inches; and Norwich, 3·63 inches.

Quarterly Meteorological Table for different Parallels of Latitude.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°							
Guernsey	29·692	70·5	38·5	32·0	58·5	47·5	25·2	10·9	51·1	47·6	·334	3·8	0·4	89	540	—	—	1·3	8	6	7	9	4·2	3·
Between the latitudes 50° and 51°	29·691	77·5	31·2	46·3	61·8	46·1	35·6	15·7	52·5	45·7	·312	3·6	1·0	78	539	96·9	42·7	1·6	6	7	8	10	—	5·
51° and 52°	29·683	83·0	28·5	54·5	64·5	44·2	43·4	20·3	53·1	45·9	·314	3·6	1·0	77	538	107·8	39·9	1·0	6	6	8	11	2·9	5·
52° and 53°	29·668	81·3	27·7	53·6	64·0	43·3	41·9	20·7	52·6	45·5	·311	3·5	1·0	77	539	110·6	37·6	1·1	7	5	9	10	5·3	5·
53° and 54°	29·661	77·1	29·7	47·4	60·9	44·0	38·7	16·9	51·1	43·8	·293	3·3	0·9	77	537	97·5	38·9	0·9	5	6	7	12	3·6	6·
54° and 55°	29·614	74·8	29·4	45·4	60·7	43·2	36·8	17·5	50·5	44·5	·297	3·3	1·0	77	540	100·7	38·4	1·2	5	5	8	12	5·6	5·
North Shields	—	73·6	31·8	41·8	57·8	44·4	31·9	13·4	49·8	43·0	·280	3·2	0·9	78	542	—	43·0	1·4	7	6	6	11	—	6·
Milltown, Banbridge (Ireland)	—	73·0	29·0	44·0	60·6	43·3	36·7	17·3	51·2	43·5	·284	3·3	1·0	76	536	103·8	38·6	1·9	5	5	13	7	—	4·
Mean for the Quarter, 50° to 55° Year 1872	29·591	82·5	29·6	52·7	61·1	43·8	39·8	17·3	51·1	44·8	·298	3·5	0·9	80	539	104·4	38·4	1·2	6	4	7	13	4·2	5·
,, 1873	29·693	76·8	28·8	48·0	61·0	43·7	37·7	17·3	51·2	44·3	·297	3·4	0·9	78	541	100·7	37·6	1·2	9	6	6	10	3·8	6·
,, 1874	29·683	78·3	30·8	47·5	62·3	43·6	40·9	18·7	51·4	44·5	·296	3·3	1·0	77	539	103·3	38·6	1·1	8	8	6	9	2·6	5·
,, 1875	29·663	78·7	29·3	49·4	62·4	44·2	39·3	18·2	52·0	45·1	·305	3·5	1·0	77	539	100·7	38·5	1·2	6	6	8	11	4·3	5·

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING SEPTEMBER 30, 1875.

Remarks on the Weather during the Quarter ending September 30th, 1875.

By James Glaisher, Esq., F.R.S., *&c.*

Following a period of warm weather of 45 days in duration ending 10th of June, one of cold began on 11th of June, and continued throughout the month of July, and till 5th of August, being of 56 days' duration, the average deficiency of daily temperature for these 56 days was 3°·1; and of that portion from 1st of July to 5th of August, or the first 36 days of this quarter, was 3°·3. On 6th of August a warm period set in, and with very slight exceptions continued till the end of the quarter; for a few days about the middle of August, and for a week following the middle of September, the weather was very warm. The average excess of mean daily temperature for these 56 days was 3°·2. It is remarkable that in the interval beginning 11th of June, and ending 30th of September, there should be two periods of equal length, viz., 56 days each, one of warm, and the other of cold weather, and that their respective departures from their averages should have been to almost the same amount.

The readings of the barometer at 160 feet above the level of the sea at about London were below their averages on the 1st, 2nd, and 3rd of July; they were above from the 4th to the 7th; below from the 8th to the 11th; a little above on the 12th and 13th; below from the 14th to the 24th; and above from the 25th to the end of the month. The highest reading in the month was 30·21 ins. on the 27th, and the lowest 29·19 ins. on the 9th. In August the readings of the barometer were above their respective averages from the 1st to the 8th (with the exception of the 6th, which was 0·02 in. below); below from the 9th to the 13th; above from the 14th to the 27th (with the exception of the 24th, which was 0·11 in. below); a little below on the 28th and 29th; and a little above on the last two days of the month. The maximum reading in the month was 30·20 ins. on the 21st, and the minimum was 29·58 ins. on the 12th. From the 1st to the 6th of September (with the exception of the 3rd, which was 0·06 in. below) the readings of the barometer were above their respective averages; they were below from the 7th to the 10th; above from the 11th to the 18th; below from the 19th to the 29th; and 0·06 in. above on the last day. The highest reading in the month occurred on the 6th, 30·17 ins., and the lowest on the 26th, 29·36 ins.

At Greenwich *the mean temperature* of July was 0°·2 higher than in June; that of August was 3°·9 higher than in July; and that of September was 3°·0 lower than that of August. (From the preceding 34 years' observations the mean temperature of July is 3°·3 higher than that of June; that of August is 0°·8 lower than that of July; and that of September is 4°·2 lower than that of August.)

The mean temperature of July *above* that of June over the whole country was 1°·4; that of August *above* that of July was 2°·5; and that of September *below* that of August was 2°·0.

The mean temperature of the air for July was 59°·1, being 2°·5 *lower* than the average of the preceding 104 years, and 3°·1 lower than the preceding 34 years; it was 5°·3 and 4°·3 lower than the corresponding values in 1874 and 1873. Back to 1771 there have been only 15 instances of July of so low or somewhat lower temperature.

The mean temperature of the air for August was 63°·0, being 2°·2 higher than the average of the preceding 104 years, and 1°·6 higher than the preceding 34 years; it was higher than the corresponding values in 1874 and 1873 by 2°·7 and 0°·3 respectively.

The mean temperature of the air of September was 60°·0, being 3°·5 higher than the average of the preceding 104 years, and 2°·8 higher than the preceding 34 years; it was respectively 2°·1 and 5°·3 higher than the corresponding values in 1874 and 1873.

Back to 1771 there have been only eight Septembers so warm as this, viz.—

1779 it was 60°·7	1846 it was 60°·1
1795 „ 60°·8	1858 „ 60°·3
1815 „ 62°·3	1865 „ 63°·9
1818 „ 60°·7	1868 „ 60°·5

The mean high day temperatures of the air were 0°·8 and 2°·5 higher than their respective averages in August and September, but 6°·8 lower in July.

The mean low night temperatures of the air were 2°·2 and 3°·8 higher than their respective averages in August and September, but of the same value as its average in July, viz. 53°·2.

Therefore the days and nights in August and September were warm, and the days in July were very cold.

The mean daily ranges of temperature were 0°·1 and 0°·4 greater than their respective averages in August and September, but 3°·8 smaller in July.

The average duration of the different directions of the wind referred to eight points of the compass, and the duration of each direction in each month in the quarter, were as follows:—

Direction of Wind.	July.			August.			September.		
	Average.	1875.	Departure from Average.	Average.	1875.	Departure from Average.	Average.	1875.	Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	2½	4	+1½	2	2	0	1½	2	+ ½
N.	3½	4	− ½	3	3	0	3½	1	−2½
N.E.	3¼	5	+1¾	3	3	0	5¼	4	−1¼
E.	1¼	3	+1¾	1½	1	− ½	1¾	5	+3¼
S.E.	½	1	+ ½	1¼	4	+2¾	1¾	3	+1¼
S.	2½	3	+ ½	3	5	+2	2	6	+4
S.W.	10½	5	−5½	10½	8	−2½	7½	4	−3½
W.	4	6	+2	3¾	5	+1¼	2½	5	+2½
Calm, nearly.	2½	0	−2½	3¼	0	−3¼	4½	0	−4½

E. & S.—550.—11/75.

The + signs denote excesses over averages; in the month of July the largest + signs are opposite the N.W., N.E., E., and W. winds; in August the + signs are opposite SE., S., and W., and in September to the E., S., and W. winds.

The − signs denote defect below averages; in July the largest number with this sign is S.W., indicating a deficiency of this wind; in August and September there is also a deficiency of this wind, but in September this deficiency is made up by both the S. and W. winds being above their averages.

At London the increase of atmospheric pressure from June to July was 0·049 in., from July to August it was 0·076 in., and the monthly mean readings of the barometer for August and September were nearly the same. Over the whole country there was an increase of pressure from June to July, but larger in amount at northern stations than at southern stations. South of latitude 51° it was 0·050 in., between 51° and 53° it was 0·079 in., and north of 53° it was 0·130 in.; from July to August there was an increase of pressure; at stations south of 52° it was 0·072 in., and north of this parallel it was 0·017 in.; the change of atmospheric pressure from August to September was very small, at some stations there was a small increase, but generally there was a small decrease, the mean from all was a decrease of 0·002 in.

The fall of rain at Greenwich in July was 5·3 ins.; back to the year 1815 there have been only four instances in July with falls so large, viz., in the year 1828, when it was 7·0 ins.; in 1834 it was 5·3 ins.; in 1853 it was 6·0 ins.; and in 1869 it was 5·8 ins. The fall of rain in July at nearly all stations greatly exceeded its average; it fell for the most part between the 13th and 23rd days, causing floods of very great violence in Monmouthshire and Glamorganshire, and in the Midland Counties generally. The fall of rain on the 14th day in Monmouthshire and Glamorganshire was as large as from 3 to 5 inches, and in Hereford and Gloucestershire from 1 to 3 inches, and exceeded one inch at many places, excepting in the northern counties, where little or no rain fell. The following table shows the daily fall of rain at our stations.

Names of Stations.	HEAVY FALLS OF RAIN from the 13th to the 23rd days of JULY 1875.										
	13th.	14th.	15th.	16th.	17th.	18th.	19th.	20th.	21st.	22nd.	23rd.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Guernsey	0·00	0·00	1·12	0·13	0·03	0·32	0·03	0·00	0·00	0·00	0·15
Helston	0·00	0·00	1·20	0·68	0·00	0·01	0·00	0·28	0·00	0·00	0·02
Truro	0·79	0·90	0·00	0·00	0·08	0·14	0·06	0·00	0·02	0·00	0·09
Osborne	0·00	1·88	0·09	0·03	0·28	0·00	0·00	0·00	0·17	0·00	0·17
Worthing	0·00	1·37	0·18	0·05	0·24	0·01	0·00	0·00	0·16	—	—
Hastings	0·00	0·00	0·77	0·11	0·25	0·06	0·23	0·00	0·00	0·06	0·00
Taunton	0·00	1·47	0·40	0·00	0·08	0·00	0·00	0·00	0·10	1·45	0·00
Salisbury	0·02	2·25	0·47	0·00	0·22	0·00	0·12	0·00	0·05	0·00	0·22
Barnstaple	0·58	1·21	0·02	0·02	0·21	0·00	0·00	0·00	0·02	0·00	0·07
Ramsgate	0·00	0·00	0·31	0·68	0·36	0·06	0·02	0·28	0·26	0·24	0·00
Strathfield Turgiss	0·00	1·69	0·83	0·02	0·26	0·06	0·02	0·01	1·78	0·00	0·11
Marlborough	0·00	0·00	2·32	0·66	0·00	0·28	0·00	0·58	0·10	0·13	0·00
Bristol	0·00	0·00	2·55	0·13	0·00	0·31	0·00	0·04	0·14	0·38	0·00
Blackheath	0·00	0·49	1·16	0·76	0·42	0·13	0·10	0·00	0·29	0·01	0·01
Streatley	0·00	0·00	1·77	0·44	0·03	0·54	0·14	—	—	—	—
Camden Square	0·00	1·29	0·93	0·27	0·17	0·07	0·03	0·02	0·44	0·08	0·15
Chiswick	0·00	0·00	1·11	1·03	0·10	0·26	0·25	0·02	0·00	0·07	0·00
Leicester	0·00	0·00	1·07	0·29	0·00	0·01	0·17	0·63	2·18	0·39	0·00
Oxford	0·03	1·71	0·45	0·00	0·23	0·15	0·05	0·79	0·17	0·00	0·01
Gloucester	0·03	1·61	0·10	0·00	0·35	0·01	0·00	0·61	0·71	0·00	1·62
Royston	0·00	1·06	0·15	0·00	0·05	0·06	0·27	0·90	0·56	0·00	0·11
Cardington	0·00	1·18	0·20	0·01	0·06	0·21	0·59	1·13	1·35	0·01	0·10
Lampeter	0·26	1·55	0·28	0·00	0·00	0·00	0·12	0·11	0·00	0·64	0·22
Somerleyton Rectory	0·00	0·48	0·25	0·00	0·47	0·45	0·26	0·69	0·00	0·00	0·00
Cambridge	0·00	0·00	1·06	0·37	0·00	0·01	0·30	0·46	1·04	0·90	0·00
Norwich	0·00	0·00	0·32	0·35	0·00	0·30	0·69	0·27	0·68	1·32	0·00
Birmingham	0·00	0·00	1·36	0·38	0·00	0·03	2·25	0·29	1·25	0·71	0·25
Wolverhampton	0·00	1·19	0·78	0·00	0·11	0·66	0·45	2·79	0·03	0·00	0·14
Wisbech	0·00	0·87	0·56	0·00	0·08	0·05	1·38	1·70	0·82	0·02	0·45
Llandudno	0·03	1·12	0·00	0·00	0·09	0·00	0·37	0·14	0·00	0·07	0·13
Nottingham	0·00	0·00	1·18	0·47	0·00	0·02	0·13	1·18	0·26	0·14	0·11
Holkham	0·22	0·02	0·41	0·23	0·00	0·40	0·70	0·35	3·06	0·77	0·05
Sheffield	0·12	0·62	0·05	0·00	0·35	0·26	0·43	0·59	0·14	0·02	0·02
Calcethorpe	0·03	0·28	0·01	0·00	1·36	0·20	0·71	0·69	0·43	0·09	0·09
Liverpool	0·00	0·12	0·43	0·00	0·00	0·17	0·01	1·00	0·29	0·00	0·01
Manchester	0·00	0·39	0·00	0·00	0·18	0·26	1·06	0·73	0·05	0·02	0·11
Eccles	0·01	0·42	0·01	0·00	0·15	0·32	1·18	0·75	0·04	0·00	0·08
Moor Side	0·00	0·04	0·14	0·00	0·00	1·18	0·07	0·70	1·75	0·05	0·00
Bermerside	0·00	0·03	0·19	0·01	0·00	1·12	0·09	0·75	1·95	0·06	0·00
Hull	0·06	0·00	0·02	0·00	0·99	0·74	0·56	0·30	0·07	0·00	0·04
Stonyhurst	0·07	0·01	0·00	0·00	0·30	0·10	0·42	1·23	0·05	0·01	0·55
Bradford	0·00	0·04	0·11	0·01	0·00	0·00	0·74	0·31	0·42	0·08	0·00
Leeds	0·00	0·09	0·12	0·01	0·00	0·41	0·20	0·44	0·45	0·12	0·04
Cockermouth	0·00	0·00	0·00	0·00	0·00	0·24	0·35	0·21	0·18	0·00	0·14
Allenheads	0·03	0·02	0·00	0·00	0·34	1·00	1·36	0·08	0·00	0·00	0·15
Silloth	0·02	0·00	0·00	0·00	0·23	0·25	0·20	0·12	0·00	0·05	0·16
Sunderland	0·01	0·03	0·00	0·00	0·00	0·34	0·94	0·64	0·03	0·00	0·00
Carlisle	0·05	0·00	0·00	0·00	0·29	0·69	0·36	0·32	0·00	0·00	0·11
Bywell	0·02	0·01	0·00	0·00	0·05	0·82	0·85	0·08	0·00	0·01	0·15
Newcastle-on-Tyne	0·03	0·04	0·00	0·00	0·00	0·50	1·02	0·96	0·00	0·00	0·00
North Shields	0·03	0·00	0·00	0·00	0·48	0·61	1·22	0·00	0·00	0·00	0·45
Milltown (Ireland)	0·05	0·00	0·00	0·00	0·00	0·23	0·71	0·41	0·00	0·08	0·11

From this Table it will be seen that very heavy rain fell on every one of these days at one part of the country or other, and that the north of England till the 17th was free from heavy rain. The falls of rain were so heavy that the natural drainage failed to carry off the water, and wherever there was high ground in the watershed, the adjacent rivers became swollen, and caused injury to all property for considerable distances from the river, and in several instances loss of life.

Thunderstorms occurred, on the 1st of July at Eccles, Halifax, Stonyhurst, Bradford, Allenheads, and Bywell; on the 2nd at Llandudno, Liverpool, and North Shields; on the 3rd at Taunton and Cardington; on the 7th at Guernsey; on the 8th at Gloucester; on the 11th at Norwich, Wisbech, Allenheads, Carlisle, Bywell, and North Shields; on the 17th at Norwich, Calcethorpe, and Hull; on the 18th at Norwich, Wisbech, Leeds, Bywell, and North Shields; on the 19th at Wisbech, Hull, Bywell, and North Shields; on the 20th at Leicester, Halifax, and North Shields; on the 21st at Streatley, Leicester, Gloucester, and Cardington; on the 22nd at Taunton; on the

rd at Osborne, Gloucester, and Cardington; and on the 25th at Leic…, orpe. On the 3rd of August at Salisbury and Leicester; on the 6th at Cardington; on … , Blackheath, Leicester, Royston, Cardington, Eccles, Halifax, and Hull; on the 8th at Guernsey, elston, Truro, and Salisbury; on the 9th at Osborne, Streatley, Oxford, Gloucester, Cardington, landudno, Calcethorpe, Halifax, Hull, Stonyhurst, Allenheads, and Bywell; on the 10th at llenheads, Bywell, and North Shields; on the 11th at Guernsey, Helston, Truro, and Hastings; n the 12th at Hastings, Leicester, Cardington, Llandudno, Calcethorpe, Eccles, Hull, and Bradford; on the 28th at Hastings; and on the 29th at Hull. On the 8th of September at Norwich, Eccles, Halifax, Stonyhurst, Bradford, Leeds, Allenheads, Bywell, and North Shields; on the 10th at Milltown; on the 13th at Guernsey; on the 14th at Helston; on the 16th at Osborne; on the 17th at Guernsey, Helston, Blackheath, and Llandudno; on the 18th at Milltown; on the 19th at Osborne, Strathfield Turgiss, Streatley, Oxford, Gloucester, Llandudno, Eccles, Halifax, Stonyhurst, Leeds, Cockermouth, and Allenheads; on the 20th at Cardington, Bradford, Silloth, and North Shields; on the 24th at Hastings, Salisbury, Gloucester, and Calcethorpe; on the 25th at Blackheath, and Wisbech; on the 26th at Bywell; and on the 27th at Hastings and Oxford.

1875. Months.	Temperature of: Air. Mean.	Air. Diff. from average of 104 years.	Air. Diff. from average of 34 years.	Evaporation. Mean.	Evaporation. Diff. from average of 34 years.	Dew Point. Mean.	Dew Point. Diff. from average of 34 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 34 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 34 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour. Diff. from average of 34 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
July -	59·1	−2·5	−3·1	56·2	−1·5	53·5	−0·4	17·5	−3·5	62·2	0·412	−0·005	4·7	+0·1
Aug. -	63·0	+2·2	+1·6	59·8	+2·5	57·1	+3·4	19·9	+0·1	65·8	0·460	+0·045	5·1	+0·5
Sept. -	60·0	+3·5	+2·8	56·7	+2·7	53·8	+2·7	18·9	+0·4	63·7	0·415	+0·036	4·6	+0·4
Means -	60·7	+1·1	+0·4	57·6	+1·2	54·8	+1·9	18·8	−1·0	63·9	0·429	+0·025	4·8	+0·3

1875. Months.	Degree of Humidity. Mean.	Degree of Humidity. Diff. from average of 34 years.	Reading of Barometer. Mean.	Reading of Barometer. Diff. from average of 34 years.	Weight of a Cubic Foot of Air. Mean.	Weight of a Cubic Foot of Air. Diff. from average of 34 years.	Rain. Amount.	Rain. Diff. from average of 60 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
July -	83	+8	29·792	−0·010	531	+3	5·3	+2·7	286	0	2	29	36·3	56·7
Aug. -	81	+5	29·868	+0·075	528	−1	2·3	−0·1	222	0	2	29	36·2	58·9
Sept. -	80	−1	29·867	+0·062	531	−2	2·7	+0·3	253	0	2	28	38·0	58·8
Means -	81	+4	29·842	+0·042	530	0	Sum 10·3	Sum +2·9	Mean 254	Sum 0	Sum 6	Sum 86	Lowest 36·2	Highest 58·9

Note.—In reading this table it will be borne in mind that the minus sign (−) signifies below the average, and that the plus sign (+) signifies above the average.

Thunder was heard, but lightning was not seen, on the 1st of July at Silloth; on the 2nd at Gloucester, Allenheads, Silloth, Bywell, and North Shields; on the 3rd at Blackheath; on the 8th at Eccles, Halifax, Hull, and Stonyhurst; on the 9th at Wisbech; on the 11th at Cardington; on the 18th at Halifax, Hull, and Allenheads; on the 19th at Calcethorpe and Carlisle; on the 21st at Oxford; on the 22nd at Osborne; on the 23rd at Hull, Stonyhurst, and North Shields; and on the 25th at Oxford and Hull. On the 3rd of August at Gloucester, Royston, Bradford, Silloth, and Carlisle; on the 6th at Salisbury and Royston; on the 7th at Truro, Norwich, and Calcethorpe; on the 8th at North Shields; on the 9th at Eccles, Silloth, and Carlisle; on the 10th at Hull and Stonyhurst; on the 12th at Strathfield Turgiss, Streatley, Oxford, Stonyhurst, Silloth, and Carlisle; on the 13th at Salisbury, Leicester, and Stonyhurst; on the 14th at Halifax; on the 19th at Strathfield Turgiss, Streatley, and Silloth; on the 26th at Streatley; and on the 29th at Strathfield Turgiss and Calcethorpe. On the 8th of September at Guernsey and Strathfield Turgiss; on the 9th at Streatley; on the 10th at Ramsgate; on the 17th at Truro, Taunton, and Leicester; on the 18th at Taunton; on the 19th and 24th at Silloth; on the 27th at Streatley, Cardington, and Eccles; and on the 28th at Cardington and Carlisle.

Lightning was seen, but thunder was not heard, on the 6th, 7th, 8th, 9th, 17th, and 18th of July; on the 3rd, 4th, 5th, 7th, 8th, 10th, 12th, 28th, 29th, and 30th of August; and on the 3rd, 6th, 7th, 8th, 9th, 16th, 17th, 18th, 19th, 21st, 24th, 25th, 27th, 28th, and 29th of September.

Solar halos were seen on 23 different days during the quarter.

Lunar halos were seen on the 17th and 18th of September.

Auroræ boreales were seen on the 14th of July at Stonyhurst; on the 24th at Silloth; and o the 29th at Cardington. On the 20th of September at Salisbury.

Hail fell on 8 different days during the quarter.

Fog prevailed on 8 days in July, 14 days in August, and on 12 days in September at differe stations.

Wheat cut,	the earliest August 2, at Cardington,	and the latest August 31, at North Shiel
Barley cut,	" July 30, at Llandudno,	" " 17, at North Shie
Oats cut,	" " 27, at Strathfield Turgiss,	" " 17, at Calcethorp
Cherry ripe,	" " 20, at Helston,	" " 22, at Hastings.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING SEPTEMBER 30TH, 1875.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the fifth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1875.	Pressure of Atmosphere in Month.		Temperature of Air in Month.						Mean Temperature.		Vapour.			Mean Degree of Humidity. Sat.n = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer.		Wind.					Mean Amount of Ozone.	Mean Amount of Cloud.	Rain.	
								Mean						In a cubic foot of Air.							Relative Proportion of							
		Months.	Mean.	Range.	Highest.	Lowest.	Range.	Of all Highest.	Of all Lowest.	Daily Range.	Air.	Dew Point.	Elastic Force.	Mean.	Short of Saturation.			Maximum in Rays of Sun.	Minimum on Grass.	Estimated Strength.	N.	E.	S.	W.			Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, SAMUEL ELLIOTT HOSKINS, ESQ., M.D., F.R.S., F.M.S.	204	July	29.774	0.832	68.5	49.5	19.0	62.7	53.9	8.8	56.3	54.1	.419	4.7	0.4	92	534	–	–	1.2	9	6	6	10	3.8	5.1	15	2.84
		Aug.	29.860	0.606	76.5	53.5	23.0	67.0	57.0	10.0	60.1	55.8	.441	4.8	1.0	86	531	–	–	0.9	10	5	6	10	3.6	4.1	13	1.23
		Sept.	29.818	0.603	76.5	52.5	24.0	66.9	57.9	9.0	61.0	57.4	.472	5.2	0.8	89	529	–	–	1.1	6	9	9	6	3.4	4.1	15	2.95
HELSTON (Cornwall), MATTHEW P. MOYLE, ESQ., M.R.C.S.	106	July	29.876	1.000	83.0	44.0	39.0	69.9	52.4	17.5	59.7	51.6	.383	4.4	1.4	77	532	94.0	48.9	2.1	12	5	5	9	4.3	3.4	13	2.92
		Aug.	29.908	0.798	78.0	44.0	34.0	73.1	54.9	18.2	62.4	54.6	.428	4.9	1.4	76	529	99.9	56.2	1.7	8	4	11	8	3.6	4.2	14	2.66
		Sept.	29.876	0.707	76.0	42.0	34.0	70.2	53.9	16.3	61.0	55.8	.443	5.0	1.0	83	530	88.8	52.1	2.1	4	11	8	7	4.3	4.7	21	5.06
TRURO (Cornwall), C. BARHAM, ESQ., M.D., F.M.S.	43	July	29.965	0.989	78.0	41.0	37.0	67.3	52.7	14.6	58.5	49.9	.360	4.0	1.5	73	535	–	–	2.5	12	3	4	12	–	5.8	15	2.70
		Aug.	30.032	0.710	77.0	42.0	35.0	70.2	54.4	15.8	60.5	53.1	.403	4.5	1.3	77	534	–	–	2.2	9	5	8	9	–	5.9	12	2.78
		Sept.	29.987	0.570	76.0	40.0	36.0	68.0	54.8	13.2	60.0	55.3	.438	4.9	0.9	85	533	–	–	2.4	4	11	4	11	–	6.2	17	5.53
OSBORNE (Isle of Wight), J. R. MANN, ESQ.	172	July	29.786	0.820	81.6	44.5	37.1	69.8	52.5	17.3	59.4	53.7	.412	4.7	0.9	82	530	100.4	51.0	0.2	8	9	6	8	–	6.2	14	3.23
		Aug.	29.869	0.614	85.6	47.9	37.7	72.6	55.2	17.4	62.0	57.3	.472	5.2	1.0	85	529	106.6	52.8	0.1	5	5	9	12	–	6.6	10	1.05
		Sept.	29.849	0.580	79.7	49.1	30.6	71.1	54.6	16.5	61.0	56.2	.447	5.0	1.0	84	530	102.5	51.7	0.3	4	10	9	7	–	4.9	11	1.43
BOURNEMOUTH (Hants), T. A. COMPTON, ESQ., M.D., B.A., F.M.S.	128	April	29.928	1.300	61.3	31.2	30.1	53.6	38.7	14.9	45.6	37.4	.237	2.6	0.8	74	542	–	–	–	9	9	5	7	–	2.8	8	1.38
		May	29.906	0.850	70.2	40.7	29.5	61.2	46.6	14.6	52.6	46.9	.321	3.6	0.8	81	543	–	–	–	6	4	7	14	–	3.1	12	1.72
		June	29.815	0.730	76.3	45.1	31.2	64.8	51.9	12.9	56.9	51.3	.378	4.2	1.0	82	536	–	–	–	4	1	10	15	–	4.6	13	2.37
BRIGHTON (Sussex), FREDERICK E. SAWYER, ESQ., F.M.S.	200	July	29.746	0.944	75.5	48.0	27.5	68.3	54.1	14.2	61.0	54.3	.422	4.7	1.3	79	528	110.1	51.8	0.8	8	8	5	10	–	6.6	12	2.85
		Aug.	29.842	0.612	77.0	44.0	33.0	70.7	56.1	14.6	62.1	55.2	.437	4.8	1.4	78	528	113.4	53.4	0.8	3	4	11	13	–	7.5	10	1.27
		Sept.	29.833	0.754	75.3	47.4	27.9	67.0	54.9	12.1	60.4	52.9	.401	4.5	1.4	76	531	104.7	51.3	1.0	6	9	8	7	–	6.6	9	1.74
HASTINGS (Manor House), ALEX. E. MURRAY, ESQ., F.M.S.	167	July	29.788	0.986	75.1	46.3	28.8	65.8	54.3	11.5	58.8	52.9	.403	4.4	1.1	81	531	–	–	1.7	10	6	6	9	–	6.7	15	2.42
		Aug.	29.878	0.601	78.1	47.7	30.4	69.2	56.2	13.0	61.5	55.4	.439	4.9	1.2	81	530	–	–	1.4	10	4	8	9	–	6.0	11	2.38
		Sept.	29.872	0.677	76.1	46.8	29.3	67.0	54.7	12.3	60.2	53.6	.412	4.6	1.3	79	531	–	–	1.7	6	10	5	9	–	5.2	15	3.42
TAUNTON (Somerset), JAMES BOTTOMLEY, ESQ.	80	July	29.937	0.864	81.0	45.0	46.0	69.8	51.2	18.6	58.8	53.5	.410	4.5	1.0	82	534	81.0	49.5	0.5	8	7	5	11	4.7	6.2	12	4.78
		Sept.	29.952	0.675	78.5	41.1	37.4	68.8	52.1	16.7	59.8	54.2	.421	4.7	0.9	83	533	81.1	52.3	0.5	4	9	7	10	5.6	6.5	15	2.62
SALISBURY (Wilton House), T. CHALLIS, ESQ.	186	July	29.785	0.818	81.0	38.0	43.0	70.8	48.4	22.4	58.2	54.0	.418	4.7	0.8	86	532	102.7	46.2	1.4	4	7	5	15	4.3	7.2	13	4.06
		Aug.	29.850	0.684	83.0	39.0	44.0	74.2	50.8	23.4	60.9	56.8	.462	5.2	0.8	87	530	120.5	49.0	1.3	7	5	3	16	4.2	7.0	9	2.30
		Sept.	29.828	0.758	79.0	41.0	38.0	71.7	48.5	23.2	59.3	53.1	.403	4.5	1.1	80	531	111.8	46.0	1.6	5	7	9	9	4.3	5.6	13	2.01
BARNSTAPLE (Devon), T. MACKRELL, ESQ.	43	July	29.895	0.890	82.0	45.0	37.0	70.3	55.4	14.9	61.0	53.0	.401	4.5	1.5	76	531	–	–	1.3	4	7	7	13	–	3.8	15	3.35
		Aug.	29.998	0.660	80.0	48.0	32.0	72.8	56.8	16.0	63.1	55.5	.442	4.9	1.5	77	530	–	–	1.0	4	3	12	12	–	3.3	16	3.30
		Sept.	29.976	0.670	79.0	47.0	32.0	69.1	57.2	11.9	62.0	56.4	.456	5.1	1.1	82	531	–	–	1.3	2	12	7	9	–	3.3	18	5.53
EASTBOURNE (Sussex), MISS W. L. HALL.	12	July	29.877	1.156	81.5	42.5	39.0	71.2	53.2	18.0	61.0	54.6	.427	4.8	1.2	80	531	121.2	48.0	0.6	4	9	8	10	3.1	–	14	2.77
		Aug.	29.991	0.584	79.8	46.5	33.3	73.9	55.2	18.7	63.7	56.9	.465	5.1	1.4	78	529	124.9	49.9	0.3	4	5	10	11	3.0	–	9	2.39
		Sept.	29.981	0.576	78.1	46.3	31.8	69.8	53.3	16.5	61.3	58.0	.472	5.3	0.7	89	531	116.3	47.0	0.6	2	10	6	12	2.6	–	14	3.54
RAMSGATE (St. Augustine's Monastery), REV. T. HUGH QUELCH, O.S.B.	108	July	29.834	0.866	81.6	43.9	37.7	69.0	53.9	15.1	60.1	50.5	.368	4.1	1.7	70	531	104.3	53.4	1.1	5	10	2	14	–	6.6	18	3.82
		Aug.	29.927	0.587	83.4	50.2	33.2	73.6	60.3	13.3	65.0	57.2	.464	5.1	1.8	77	527	117.7	55.1	1.0	7	9	9	6	–	5.9	8	1.91
		Sept.	29.942	0.664	79.1	47.6	31.5	69.2	54.7	14.5	61.3	54.0	.418	4.7	1.3	78	531	107.5	53.2	1.0	6	8	6	10	–	4.5	11	1.67

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1875. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean. Of all Highest.	Temperature of Air in Month. Mean. Of all Lowest.	Temperature of Air in Month. Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a Cubic foot of Air. Mean.	Vapour. In a Cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Satn. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°										in.
STRATHFIELD TURGISS (Hants), Rev. C. H. Griffith, M.A., F.M.S.	197	July	29.764	1.019	77.7	40.9	36.8	68.2	50.5	17.7	58.0	51.9	.386	4.3	1.1	80	532	115.3	46.8	0.7	10	6	6	9	3.6	7.1	15	5.75
		Aug.	29.838	0.628	83.7	40.9	42.8	72.2	52.5	19.7	61.1	54.4	.424	4.7	1.3	79	530	120.7	48.0	0.5	8	6	5	12	3.7	6.4	11	1.29
		Sept.	29.825	0.734	81.3	40.3	41.0	69.7	50.2	19.5	59.2	54.3	.422	4.7	0.9	85	532	114.8	46.0	0.5	6	8	8	8	2.7	5.4	12	1.89
WEYBRIDGE HEATH (Surrey), William F. Harrison, Esq., F.M.S.	150	July	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.53
		Aug.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.84
		Sept.	29.918	0.795	82.5	40.8	41.7	71.3	50.4	20.9	59.6	54.4	.424	4.7	1.0	84	533	106.4	47.7	0.7	7	6	11	6	0.5	5.3	12	1.64
MARLBOROUGH, The Green, (Wilts), Rev. Thomas A. Preston, M.A., F.M.S.	474	July	29.477	0.980	76.7	39.6	37.1	66.6	50.3	16.3	57.1	52.1	.389	4.2	1.1	83	527	112.4	46.7	0.2	7	10	4	10	—	6.4	14	5.66
		Aug.	29.544	0.660	81.9	41.2	40.7	70.8	52.6	18.2	60.4	54.2	.421	4.7	1.0	81	525	121.3	49.0	0.2	10	3	6	12	—	5.7	13	2.12
		Sept.	29.334	0.802	78.0	41.2	36.8	68.2	50.8	17.4	58.3	52.8	.400	4.4	1.0	81	527	113.9	47.0	0.2	4	11	6	9	—	5.5	17	3.77
BLACKHEATH (London), James Glaisher, Esq., F.R.S.	160	July	29.778	1.017	78.6	46.0	32.6	67.6	53.2	14.4	58.7	52.0	.389	4.5	0.9	79	531	112.8	50.3	1.4	8	6	6	11	—	6.4	18	5.10
		Aug.	29.863	0.612	86.2	44.3	41.9	73.7	55.3	18.4	62.6	54.3	.422	4.6	1.7	75	528	124.7	52.2	1.2	5	5	11	10	—	5.5	11	2.08
		Sept.	29.867	0.809	80.7	44.8	35.9	70.2	53.0	17.2	60.0	54.2	.420	4.7	1.1	81	531	112.1	50.0	1.2	4	9	9	8	—	5.2	13	2.76
STREATLEY VICARAGE (Berks), Rev. J. Slatter, M.A., F.R.A.S., F.M.S.	150	July	29.820	1.046	80.8	37.3	43.5	68.8	48.2	20.6	57.8	52.0	.386	4.3	0.9	81	533	78.6	—	1.7	8	9	5	9	—	7.0	20	5.51
		Aug.	29.890	0.591	85.2	40.3	44.9	73.9	50.9	23.0	61.6	54.8	.429	4.7	1.3	79	530	—	—	1.5	7	2	9	13	—	6.2	13	2.00
		Sept.	29.880	0.816	83.0	39.2	43.8	71.3	49.4	21.9	60.3	53.0	.399	4.5	1.4	77	531	—	—	1.8	7	5	8	10	—	5.1	12	1.86
CAMDEN SQUARE (London), G. J. Symons, Esq., F.M.S.	123	July	29.836	1.017	80.4	42.5	37.9	69.8	52.2	17.6	59.6	52.8	.400	4.5	1.2	79	531	112.3	49.8	—	10	5	7	11	—	5.9	17	4.64
		Aug.	29.915	0.647	86.1	45.3	40.8	74.7	55.0	19.7	63.0	55.6	.443	4.9	1.5	77	528	123.4	51.8	—	9	2	8	12	—	4.9	12	1.79
		Sept.	29.915	0.734	82.8	44.2	36.6	70.8	52.3	18.5	60.4	54.4	.424	4.7	1.1	81	532	109.0	49.1	—	8	2	9	11	—	4.8	15	2.86
CHISWICK (Middlesex), Mr. J. K. M. L. Farquhar.	25	July	29.931	0.856	79.2	39.0	40.2	69.8	50.7	19.1	58.8	53.5	.410	4.6	1.0	81	534	121.3	—	1.0	8	7	7	9	—	7.2	18	5.16
		Aug.	30.004	0.630	85.2	40.2	45.0	74.8	52.7	22.1	62.5	54.2	.420	4.6	1.7	74	531	131.9	47.4	0.8	6	5	10	10	—	6.9	8	0.74
		Sept.	30.020	0.658	81.5	43.0	38.5	71.8	51.4	20.4	60.8	54.1	.420	4.8	1.0	80	533	114.9	44.7	1.3	4	9	7	10	—	6.7	13	2.23
LEICESTER (Town Museum), W. J. Harrison, Esq.	245	July	29.710	1.071	74.4	43.6	30.8	66.6	51.8	14.8	58.2	51.8	.382	4.2	1.2	79	531	118.8	45.0	0.8	7	9	5	10	—	7.3	18	6.46
		Aug.	29.770	0.574	83.2	44.3	38.9	69.2	53.7	15.5	60.8	53.2	.404	4.5	1.3	76	529	125.6	48.1	0.6	6	8	8	9	—	7.3	15	2.65
		Sept.	29.766	0.886	78.1	44.7	33.4	66.2	51.8	14.4	58.2	51.6	.383	4.2	1.2	79	532	112.9	46.0	1.0	4	9	9	8	—	5.7	17	2.65
OXFORD, Rev. R. Main, M.A., F.R.S., F.R.A.S.	210	July	29.731	1.008	76.3	44.9	31.4	67.7	52.1	15.6	59.2	52.6	.400	4.5	1.2	80	530	109.9	48.1	0.9	9	7	4	11	3.0	7.3	18	4.70
		Aug.	29.794	0.661	82.4	44.6	37.8	71.4	55.0	16.4	62.4	55.4	.439	4.9	1.4	78	527	118.7	52.2	0.7	6	4	7	14	2.3	7.1	12	1.80
		Sept.	29.779	0.847	76.4	42.8	33.6	68.1	52.5	15.6	60.0	53.2	.404	4.5	1.2	78	530	114.7	49.2	0.8	4	9	8	9	2.8	6.6	15	2.03
GLOUCESTER, E. Toller, Esq., M.D.	100	July	29.920	0.976	80.9	41.8	39.1	71.9	51.0	20.9	59.4	53.2	.405	4.5	1.2	81	533	112.5	45.5	0.5	10	8	4	9	0.8	5.7	15	6.66
		Aug.	29.973	0.650	86.6	40.7	45.9	73.4	52.9	22.5	62.2	54.4	.424	4.7	1.6	76	531	115.8	46.8	0.6	7	3	8	13	0.4	5.6	11	1.07
		Sept.	29.956	0.656	79.7	39.4	40.3	73.2	50.9	22.3	60.1	56.7	.462	5.2	0.6	89	533	105.7	43.1	0.7	7	7	7	9	1.3	6.1	11	2.41
ROYSTON (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	July	29.725	1.031	80.4	42.7	37.7	70.3	49.8	20.5	57.9	53.1	.406	4.5	0.9	84	531	—	—	—	10	7	3	11	—	6.8	16	4.52
		Aug.	29.784	0.623	86.4	41.4	45.0	75.5	51.9	23.6	62.2	55.6	.445	4.9	1.3	79	527	—	—	—	4	4	9	14	—	5.9	12	1.57
		Sept.	29.772	0.715	81.2	42.3	38.9	70.2	50.8	19.4	58.9	52.6	.398	4.4	1.1	79	531	—	—	—	5	7	9	9	—	5.1	14	2.06
CARDINGTON (near Bedford), Mr. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	105	July	29.853	0.930	77.0	40.0	37.0	69.1	51.7	17.4	59.1	53.8	.415	4.7	0.9	83	532	99.0	48.4	1.7	8	8	5	10	—	6.7	17	6.50
		Aug.	29.921	0.606	85.2	44.0	41.2	72.8	53.4	19.4	62.5	53.3	.437	4.9	1.4	78	530	103.5	48.1	1.2	8	3	8	12	—	6.7	11	2.50
		Sept.	29.927	0.684	78.6	41.0	37.6	68.6	51.1	17.5	59.2	53.5	.412	4.7	0.9	82	533	92.5	47.1	1.4	5	7	8	10	—	5.0	13	2.36
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	July	29.892	0.942	76.8	42.8	34.0	67.5	52.8	14.7	58.6	54.6	.428	4.8	0.7	86	533	—	45.6	1.1	5	11	9	6	7.7	6.3	15	3.96
		Aug.	29.268	0.554	87.0	42.5	44.5	73.3	54.0	19.3	62.2	55.8	.438	4.9	1.6	78	531	—	45.5	1.3	5	9	11	5	6.7	5.2	10	1.00
		Sept.	29.988	0.710	77.7	41.7	36.0	68.0	52.8	15.2	59.3	55.7	.444	5.0	0.7	89	534	—	44.8	1.4	5	9	9	7	6.6	5.0	12	2.39
CAMBRIDGE (Cambridgeshire), J. W. L. Glaisher, Esq., M.A., F.R.S.	40	July	29.916	0.946	79.0	43.0	36.0	70.6	50.9	19.7	59.2	56.2	.449	5.0	0.8	90	533	131.4	48.4	1.8	5	11	8	7	—	6.9	16	4.28
		Aug.	29.972	0.605	88.0	42.5	45.5	75.2	53.9	21.3	63.3	58.2	.483	5.3	1.1	84	529	139.8	49.1	2.2	9	5	5	12	—	6.6	10	1.00
		Sept.	29.978	0.726	82.4	43.0	39.4	70.9	51.4	19.5	60.0	54.4	.423	4.7	1.1	82	533	124.3	46.3	1.9	8	8	7	7	—	6.0	13	2.25

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1875. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean. Of all Highest.	Mean. Of all Lowest.	Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.
	feet.		in.	in.	°	°	°	°	°	°	°	°
NORWICH (Norfolk), John Quinton, Esq., Jun.	42	July	29·906	1·080	75·5	44·0	31·5	66·7	52·9	13·8	58·3	54·5
		Aug.	29·983	0·498	78·0	47·5	30·5	71·4	55·3	16·1	61·9	57·7
		Sept.	29·989	0·778	80·0	43·8	36·2	67·6	53·6	14·0	59·6	56·4
WISBECH (Cambridgeshire), S. H. Miller, Esq., F.R.A.S., F.M.S.	14	July	29·951	0·970	78·0	41·0	37·0	69·3	52·2	17·1	59·0	54·6
		Aug.	29·999	0·596	83·7	48·2	35·5	73·5	54·4	19·1	62·5	57·1
		Sept.	30·010	0·762	81·0	43·0	38·0	69·5	52·4	17·1	59·8	54·6
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	July	29·883	1·010	77·0	47·2	29·8	66·9	52·6	14·3	58·0	51·2
		Aug.	29·900	0·630	76·2	47·5	28·7	69·0	55·4	13·6	61·2	53·0
		Sept.	29·885	0·800	78·0	49·0	29·0	66·3	54·0	12·3	59·4	52·2
NOTTINGHAM (Notts.), M. O. Tarbotton, Esq., C.E., F.G.S., F.M.S.	183	July	29·749	0·974	83·9	40·9	43·0	69·3	51·3	18·0	58·5	51·5
		Aug.	29·806	0·542	87·0	43·1	43·9	71·3	52·7	18·6	60·5	53·2
		Sept.	29·817	0·794	79·3	40·1	39·2	67·8	51·2	16·6	58·5	53·2
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	July	29·891	0·948	74·7	40·9	33·8	65·7	49·5	16·2	57·0	52·6
		Aug.	29·949	0·594	84·9	42·2	42·7	70·3	51·5	18·8	60·9	52·6
		Sept.	29·965	0·758	76·7	43·2	33·5	66·3	49·5	16·8	58·0	52·9
CALCETHORPE MANOR (near) Louth (Lincolnshire), D. Grant Briggs, Esq., F.M.S.	382	July	29·568	1·076	71·3	41·5	29·8	63·7	50·2	13·5	55·6	50·8
		Aug.	29·614	0·623	80·8	44·0	36·8	67·8	52·8	15·0	59·0	52·7
		Sept.	29·631	0·929	71·6	41·4	30·2	63·7	50·8	12·9	56·3	50·7
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	July	29·761	1·011	75·7	47·9	27·8	64·5	52·8	11·7	57·3	49·4
ECCLES (near Manchester), T. Mackereth, Esq., F.R.A.S., F.M.S.	145	July	29·825	1·042	78·9	40·3	38·6	68·2	49·5	18·7	57·6	51·6
		Aug.	29·855	0·614	78·8	42·0	36·8	69·8	51·4	18·4	59·7	53·7
		Sept.	29·853	1·064	76·6	42·9	33·7	67·2	50·8	16·4	58·0	51·7
MOOR SIDE OBSERVATORY, HALIFAX (Yorkshire), Louis J. Crossley, Esq., F.R.A.S.	429	July	29·533	0·990	75·5	43·0	32·5	67·5	51·8	15·7	58·0	49·5
		Aug.	29·560	0·610	79·0	43·2	35·8	69·3	53·0	16·3	59·4	52·6
		Sept.	29·574	0·871	73·1	42·0	31·1	65·0	50·9	14·1	56·6	50·2
BERMERSIDE OBSERVATORY, HALIFAX (Yorkshire), Edward Crossley, Esq., F.R.A.S.	520	July	29·415	1·014	78·0	42·3	35·7	66·7	48·8	17·9	56·4	47·8
		Sept.	29·477	0·942	75·0	40·2	34·8	64·4	48·5	15·9	55·5	51·0
HULL (The Park), Mr. E. Peak.	12	July	29·960	1·042	72·0	42·0	30·0	66·1	49·9	16·2	57·8	49·8
		Aug.	30·000	0·596	83·0	42·0	41·0	69·7	53·3	16·4	60·7	55·6
		Sept.	30·004	0·846	72·0	42·0	30·0	65·2	51·6	13·6	57·9	52·4
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.A.S., F.M.S.	363	July	29·577	1·064	77·4	41·8	35·6	68·0	49·9	18·1	57·2	52·4
		Aug.	29·610	0·589	77·7	43·0	34·7	68·2	51·8	16·4	58·8	53·5
		Sept.	29·625	0·892	74·5	42·6	31·9	65·7	51·0	14·7	57·4	51·7
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	July	29·601	1·185	75·0	45·4	29·6	68·0	52·5	15·5	58·8	48·3
		Aug.	29·581	0·612	80·0	45·8	34·2	67·3	53·6	13·7	59·2	50·8
		Sept.	29·607	0·862	75·6	44·2	31·4	65·2	52·0	13·2	57·1	50·3
LEEDS PHILOSOPHICAL HALL (Yorkshire), Louis C. Miall, Esq.	137	July	29·820	0·995	83·0	44·0	39·0	70·7	52·2	18·5	60·6	50·5
		Aug.	29·851	0·618	85·0	45·0	40·0	69·3	53·5	15·8	60·7	53·5
		Sept.	29·873	0·911	79·0	43·0	36·0	67·4	51·0	16·4	58·4	51·9

Names of Stations and Observers.	Months.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity, Sat.° = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
		in.	grs.	gr.		grs.	°	°									in.
NORWICH	July	·426	4·7	0·7	87	534	–	–	–	6	11	5	9	–	7·6	15	5·89
	Aug.	·477	5·3	0·9	86	530	–	–	–	8	4	8	11	–	–	8	0·95
	Sept.	·456	5·1	0·7	90	534	–	–	–	5	10	8	7	–	–	14	2·34
WISBECH	July	·427	4·8	0·8	86	534	113·8	49·2	0·5	10	6	6	9	3·8	7·4	16	7·15
	Aug.	·462	5·2	1·1	82	531	119·8	50·6	0·6	8	5	7	11	2·7	6·9	12	2·39
	Sept.	·426	4·7	1·0	83	534	111·1	48·1	0·5	8	7	8	7	3·7	5·1	14	2·22
LLANDUDNO	July	·377	4·2	1·2	78	534	–	–	0·6	7	5	4	15	–	5·9	15	3·47
	Aug.	·401	4·4	1·6	75	531	–	–	0·6	3	5	6	17	–	5·5	13	2·00
	Sept.	·391	4·4	1·2	78	532	–	–	0·8	2	8	7	13	–	5·9	16	4·65
NOTTINGHAM	July	·381	4·3	1·2	78	531	118·5	49·5	0·5	11	8	5	7	4·0	6·6	17	5·82
	Aug.	·405	4·5	1·4	77	530	117·6	49·5	0·5	8	6	10	7	2·8	6·0	16	3·73
	Sept.	·406	4·4	1·1	83	532	104·4	48·4	0·6	4	10	8	8	2·9	6·7	18	2·79
HOLKHAM	July	·396	4·4	0·8	85	535	113·8	47·4	1·6	13	7	6	5	–	6·9	18	8·81
	Aug.	·392	4·5	1·5	75	532	115·8	49·0	1·8	11	4	9	7	–	5·7	10	0·99
	Sept.	·401	4·5	0·9	83	535	121·7	47·2	1·8	8	7	9	6	–	5·6	14	1·80
CALCETHORPE MANOR	July	·371	4·2	0·8	84	531	118·2	47·7	0·9	9	11	5	6	5·9	7·3	19	5·23
	Aug.	·399	4·5	1·1	80	526	125·7	50·0	0·8	7	7	8	9	6·9	6·7	16	3·65
	Sept.	·370	4·2	0·9	82	531	114·8	48·2	1·0	6	8	9	7	7·2	5·6	17	1·94
LIVERPOOL OBSERVATORY	July	·355	3·9	1·3	74	533	–	–	1·2	6	7	5	13	–	5·4	19	4·16
ECCLES	July	·382	4·3	1·1	80	533	83·9	43·1	0·2	10	5	4	12	2·2	6·6	18	5·62
	Aug.	·413	4·6	1·1	82	531	85·4	43·4	0·2	5	6	8	12	1·3	6·8	22	4·07
	Sept.	·384	4·3	1·1	81	533	78·8	43·0	0·4	2	8	7	13	1·3	5·5	16	5·49
MOOR SIDE OBSERVATORY	July	·355	3·9	1·5	74	528	104·0	47·2	1·1	8	11	3	9	1·2	7·2	18	5·77
	Aug.	·397	4·4	1·2	79	527	100·1	47·9	1·2	6	7	6	12	0·3	7·6	15	3·06
	Sept.	·364	4·2	0·8	81	530	92·3	46·1	1·0	4	11	4	11	1·3	6·6	15	4·39
BERMERSIDE OBSERVATORY	July	·334	3·8	1·4	73	528	106·3	47·5	0·5	7	10	5	9	–	5·8	16	6·10
	Sept.	·375	4·2	0·7	86	529	100·0	–	0·6	3	12	7	8	–	6·1	15	4·52
HULL	July	·359	4·0	1·2	75	536	92·0	47·7	–	–	–	–	–	2·1	–	16	3·96
	Aug.	·443	5·0	1·0	84	533	97·3	49·7	–	–	–	–	–	1·8	–	14	4·06
	Sept.	·394	4·4	1·0	82	536	91·8	46·3	–	–	–	–	–	2·7	–	12	2·65
STONYHURST	July	·392	4·3	0·9	84	529	120·9	48·3	–	6	7	2	16	–	6·8	18	5·69
	Aug.	·410	4·5	1·0	81	528	120·8	50·0	–	5	6	6	14	–	7·4	20	3·76
	Sept.	·384	4·3	0·9	81	530	114·0	49·9	–	8	6	10	6	–	6·6	16	5·88
BRADFORD	July	·339	3·9	1·7	69	528	94·6	–	0·7	7	9	5	10	–	5·6	15	4·10
	Aug.	·366	4·3	1·4	74	527	87·9	–	0·9	5	6	4	16	–	6·9	12	2·72
	Sept.	·366	4·1	1·1	78	530	86·7	–	0·6	2	13	4	11	–	5·3	18	3·46
LEEDS PHILOSOPHICAL HALL	July	·366	4·1	1·7	69	530	93·2	–	1·0	11	7	6	7	–	6·3	10	3·11
	Aug.	·409	4·5	1·3	77	530	90·1	–	1·0	9	4	4	14	–	7·4	21	1·72
	Sept.	·386	4·3	1·2	79	533	84·5	–	1·0	5	9	6	10	–	5·5	14	2·74

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1875.	Pressure of Atmosphere in Month.		Temperature of Air in Month.						Mean Temperature.		Vapour.			Mean Degree of Humidity. Sat. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer.		Wind.					Mean Amount of Ozone.	Mean Amount of Cloud.	Rain.	
								Mean						In a cubic foot of Air.							Relative Proportion of							
		Months.	Mean.	Range.	Highest.	Lowest.	Range.	Of all Highest.	Of all Lowest.	Daily Range.	Air.	Dew Point.	Elastic Force.	Mean.	Short of Saturation.			Maximum in Rays of Sun.	Minimum on Grass.	Estimated Strength.	N.	E.	S.	W.			Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
COCKERMOUTH (Cumberland), H. Dodgson, Esq., M.D., F.R.A.S., F.M.S.	146	July	29.811	1.122	77.2	39.9	37.3	67.8	50.8	17.0	58.2	52.1	.390	4.4	1.1	80	532	115.0	44.0	0.3	4	10	9	8	1.5	3.6	14	3.11
		Aug.	29.814	0.612	73.0	44.9	28.1	67.6	54.1	13.5	59.6	52.8	.400	4.5	1.2	79	531	108.8	47.3	0.4	4	8	14	5	2.1	6.7	17	3.34
		Sept.	29.814	0.968	78.4	39.9	38.5	66.0	52.1	13.9	57.7	51.2	.378	4.2	1.0	80	533	101.8	43.0	0.5	2	11	9	8	2.1	5.4	16	5.38
ALLENHEADS (Northumberland), Mr. T. Kidd, Assistant to W. B. Beaumont, Esq., M.P.	1360	July	28.600	0.928	75.0	38.3	36.7	65.6	48.2	17.4	55.3	—	—	—	—	—	—	109.3	45.8	1.0	6	5	12	8	—	5.0	15	6.02
		Aug.	28.572	0.617	71.5	39.0	32.5	63.5	49.6	13.9	54.8	—	—	—	—	—	—	108.9	46.5	1.0	5	5	9	12	—	7.1	16	1.99
		Sept.	28.511	1.050	68.5	37.0	31.5	59.7	46.2	13.5	51.7	—	—	—	—	—	—	101.6	43.9	1.4	1	11	8	10	—	6.2	18	4.20
SILLOTH RECTORY (Cumberland), Rev. Francis Redford., M.A., F.R.A.S., F.M.S.	28	July	29.944	1.040	79.8	41.8	38.0	71.5	50.1	21.4	59.0	52.0	.388	4.4	1.2	78	534	106.3	46.3	1.2	3	9	4	15	7.4	4.4	16	2.07
		Aug.	29.953	0.637	75.5	44.2	31.3	70.3	53.4	16.9	60.2	54.5	.424	4.7	1.1	82	532	102.8	49.6	1.2	2	9	5	14	8.4	6.2	16	2.10
		Sept.	29.944	1.158	77.2	38.9	38.3	66.0	50.1	15.9	57.0	50.8	.371	4.1	1.1	79	536	96.6	46.7	1.4	1	12	6	11	8.9	5.2	18	4.48
CARLISLE (Cumberland), Isaac Cartmell, Esq., F.M.S.	114	July	29.861	1.089	78.3	39.7	38.6	69.1	48.6	20.5	58.3	48.3	.338	3.8	1.7	69	533	106.7	44.2	1.7	6	7	3	15	6.9	5.4	15	4.03
		Aug.	29.840	0.902	74.8	38.6	36.2	68.6	51.7	16.9	59.2	53.1	.405	4.6	1.1	81	532	101.0	47.3	2.0	5	5	7	14	6.7	7.2	19	2.14
		Sept.	29.880	1.044	77.4	37.3	40.1	65.2	48.1	17.1	55.8	49.6	.357	4.0	1.0	81	536	88.7	43.4	1.7	4	10	6	10	5.5	6.2	19	3.61
BYWELL (Northumberland), Mr. John Dawson, Assistant to W. B. Beaumont, Esq., M.P.	87	July	29.845	1.026	78.0	46.0	32.0	67.8	54.2	13.6	59.0	49.5	.354	4.0	1.6	71	532	98.2	48.3	1.3	6	12	5	8	—	3.7	17	4.21
		Aug.	29.856	0.558	77.0	47.0	30.0	67.5	55.1	12.4	59.6	52.8	.400	4.5	1.2	79	532	87.0	49.6	1.1	4	9	5	13	—	5.0	21	4.19
		Sept.	29.856	1.166	72.0	43.0	29.0	65.3	51.5	13.8	56.7	51.5	.381	4.3	0.9	83	535	88.4	45.6	1.2	3	12	4	11	—	4.8	17	2.02
NORTH SHIELDS (Northumberland), Robert Spence, Esq.	124	July	29.872	0.999	71.0	44.0	27.0	62.5	51.4	11.1	55.9	50.3	.366	4.1	0.9	82	536	—	50.4	1.5	12	8	4	7	—	5.1	12	5.38
		Aug.	29.891	0.651	72.3	42.8	29.5	64.8	53.4	11.4	57.8	51.4	.380	4.3	0.9	84	534	—	52.7	1.5	8	5	4	14	—	6.4	16	3.41
		Sept.	29.900	1.123	70.3	41.8	28.5	59.0	51.2	7.8	54.8	49.3	.350	3.9	0.9	81	538	—	50.0	1.5	10	7	3	10	—	5.8	19	2.59
MILLTOWN (Banbridge, Ireland), John P. Smyth, Esq., jun., M.A., M.I.C.E.I., F.G.S.	200	July	29.662	1.124	74.0	37.0	37.0	65.6	48.8	16.8	56.2	48.8	.348	3.9	1.1	76	532	104.0	46.5	1.7	11	4	7	9	—	4.6	17	3.87
		Aug.	29.636	0.632	72.0	42.0	30.0	66.7	52.4	14.3	58.3	52.0	.389	4.3	1.1	79	529	—	46.5	1.7	5	5	10	11	—	5.5	15	2.42
		Sept.	29.626	0.947	70.0	39.0	31.0	63.5	49.6	13.9	56.4	50.1	.365	4.2	0.8	80	531	113.0	43.6	2.0	6	9	10	5	—	4.2	14	4.65

Note.—*The Barometer Reading*, Leeds, 12th September, 10h. a.m., 30.480 in., has been altered to 30.280 in.
" " 13th " 10h. a.m., 30.475 in., " 30.275 in.
" " 13th " 4h. p.m., 30.460 in., " 30.260 in.
" " 16th " 4h. p.m., 30.890 in., " 30.090 in.
" " 17th " 10h. a.m., 30.680 in., " 30.086 in.
" " 17th " 4h. p.m., 30.206 in., " 30.006 in.

Second Rain-gauges are placed—

			July.	August.	September.	Total during the Quarter.
At Strathfield Turgiss, at the height of	33 feet	*above the ground*, the amount collected was	2.59 inches.	0.85 inches.	1.30 inches.	4.74 inches.
" Oxford, "	22 feet	" "	4.55 "	1.84 "	1.99 "	8.38 "
" Cardington, "	36 feet	" "	5.75 "	2.00 "	2.00 "	9.75 "
" Wisbech, "	8 feet	" "	7.08 "	2.38 "	2.21 "	11.67 "
" Nottingham, "	39 feet	" "	5.55 "	3.82 "	2.46 "	11.83 "
" Holkham, "	4 feet	" "	8.43 "	1.09 "	1.81 "	11.33 "
" Eccles (Manchester), "	34 feet	" "	5.31 "	3.79 "	4.92 "	14.02 "
" Milltown (Ireland), "	40 feet	" "	3.65 "	2.38 "	4.36 "	10.39 "

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind: Mean Estimated Strength.	Wind: Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain: Number of Days on which it fell.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°								
Guernsey	29·593	76·5	49·5	27·0	65·5	56·3	22·0	9·2	59·1	55·8	·444	4·9	0·7	89	531	—	—	1·1	8	7	7	9	3·6	4·4	43
Helston	29·583	83·0	42·0	41·0	71·1	53·7	35·7	17·4	61·0	51·0	·418	4·8	1·3	79	530	91·2	52·4	2·0	8	7	8	8	4·1	4·1	48
Truro	29·595	78·0	40·0	38·0	68·5	54·0	36·0	14·5	59·7	52·8	·400	4·5	1·2	78	534	—	—	2·4	8	6	5	11	—	6·6	44
Osborne	29·576	85·6	44·5	41·1	71·2	54·1	35·1	17·1	60·8	55·7	·444	5·0	1·0	84	530	103·2	51·8	0·2	6	8	8	9	—	5·9	35
Brighton	29·599	77·0	44·0	33·0	68·7	55·0	29·5	13·7	61·2	54·1	·420	4·7	1·4	78	529	109·1	52·2	0·9	6	7	8	10	—	6·2	31
Hastings	29·611	78·1	46·3	31·8	67·3	55·1	29·5	12·2	60·2	54·0	·418	4·6	1·2	80	531	—	—	1·6	9	7	6	9	—	6·0	41
Salisbury	29·588	83·0	38·0	45·0	72·2	49·2	41·7	23·0	59·5	54·6	·428	4·8	0·9	84	531	111·7	47·1	1·4	5	6	6	13	4·3	6·8	35
Barnstaple	29·569	82·0	45·0	37·0	70·7	56·5	23·7	14·2	62·0	55·0	·433	4·8	1·4	78	531	—	—	1·2	3	7	9	11	—	3·5	49
Ramsgate	29·600	82·4	43·9	38·5	70·6	56·3	33·8	14·3	62·1	53·9	·417	4·6	1·6	75	530	109·8	53·9	1·0	8	9	6	10	—	5·6	37
Strathfield Turgiss	29·611	83·7	40·3	43·4	70·0	51·1	40·2	18·9	59·4	53·5	·411	4·6	1·0	81	531	116·9	46·9	0·6	8	7	6	10	3·3	6·3	58
Marlborough Green	29·596	81·9	39·6	42·3	68·5	51·2	38·2	17·3	58·7	53·0	·403	4·4	1·0	82	526	115·9	47·6	0·2	7	8	5	10	—	5·9	44
Blackheath	29·598	86·2	44·3	41·9	70·5	53·8	36·8	16·7	60·4	53·5	·410	4·6	1·2	78	530	116·5	50·8	1·3	6	7	8	10	—	5·7	42
Streatley Vicarage	29·622	85·2	37·3	47·9	71·3	49·5	44·1	21·8	59·9	53·3	·405	4·5	1·2	79	531	—	—	1·7	7	5	7	11	—	6·1	45
Camden Square	29·600	86·1	42·5	43·6	71·8	53·2	38·4	18·6	61·0	54·3	·422	4·7	1·3	79	530	114·9	50·2	—	9	2	8	11	—	5·2	44
Chiswick	29·595	85·2	39·0	46·2	72·1	51·6	41·2	20·5	60·7	53·9	·417	4·7	1·2	78	533	122·7	—	1·0	6	7	8	10	—	6·9	39
Leicester	29·623	83·2	43·6	39·6	67·3	52·4	34·4	14·9	59·1	52·2	·390	4·3	1·2	78	531	119·1	46·4	0·8	6	9	7	9	—	6·8	50
Oxford	29·581	82·4	42·8	39·6	69·1	53·2	34·3	15·9	60·5	53·7	·414	4·6	1·3	79	529	114·4	49·8	0·8	6	7	6	11	2·7	7·0	45
Gloucester	29·628	86·6	39·4	47·2	73·5	51·6	41·8	21·9	60·6	54·8	·430	4·8	1·1	82	532	111·3	45·1	0·6	8	6	6	10	0·8	5·8	37
Royston	29·634	86·4	41·4	45·0	72·0	50·8	40·5	21·2	59·7	53·8	·416	4·6	1·1	81	530	—	—	—	6	6	7	11	—	5·9	42
Cardington	29·587	85·2	40·0	45·2	70·2	52·1	38·6	18·1	60·3	54·2	·421	4·8	1·1	81	532	98·3	47·9	1·4	7	5	7	11	—	6·1	41
Cambridge	29·546	88·0	42·5	45·5	72·2	52·1	40·3	20·1	60·8	56·3	·452	5·0	1·0	85	532	131·8	47·9	2·0	7	8	7	9	—	6·5	29
Norwich	29·536	80·0	43·8	36·2	68·6	53·9	32·7	14·7	59·9	56·2	·458	5·0	0·8	88	532	—	—	—	6	8	7	9	—	—	37
Wisbech	29·564	83·7	41·0	42·7	70·8	53·0	46·8	17·8	60·4	55·4	·438	4·9	1·0	84	533	114·9	49·3	0·5	9	6	7	9	3·0	6·5	42
Llandudno	29·607	78·0	47·2	30·8	67·4	54·0	29·2	13·4	59·5	52·1	·390	4·3	1·3	77	532	—	—	0·7	4	6	6	15	—	5·8	44
Nottingham	29·590	87·0	40·1	46·9	69·5	51·7	42·0	17·8	59·2	52·6	·397	4·4	1·2	79	531	113·5	49·1	0·5	8	8	8	7	3·2	6·4	51
Calcethorpe	29·629	80·8	41·4	39·4	65·1	51·3	32·3	13·8	57·0	51·4	·380	4·3	0·9	82	530	119·6	48·6	0·9	7	9	7	7	6·7	6·5	52
Eccles	29·607	78·9	40·3	38·6	68·4	50·6	36·1	17·8	58·4	52·3	·393	4·4	1·1	81	532	82·7	43·2	0·3	6	6	6	12	1·6	6·3	56
Moorside, Halifax	29·639	79·0	42·0	37·0	67·3	51·9	33·1	15·4	58·0	50·8	·372	4·2	1·2	78	528	98·8	47·1	1·1	6	10	4	11	0·9	7·1	48
Hull	29·602	83·0	42·0	41·0	67·0	51·6	33·7	15·4	58·8	52·6	·399	4·5	1·1	80	535	93·7	47·9	—	—	—	—	—	2·2	—	42
Stonyhurst	29·594	77·7	41·8	35·9	67·3	50·9	34·1	16·4	57·8	52·5	·395	4·4	0·9	82	529	118·6	49·4	—	6	6	6	12	—	6·9	54
Bradford	29·623	80·0	44·2	35·8	66·8	52·7	31·7	14·1	58·4	49·8	·357	4·1	1·4	74	528	89·7	—	0·7	5	9	4	12	—	5·9	45
Leeds	29·609	85·0	43·0	42·0	69·1	52·2	38·3	16·9	59·9	52·0	·387	4·3	1·4	75	531	89·4	—	1·0	8	7	5	10	—	6·4	54
Cockermouth	29·584	78·4	39·9	38·5	67·1	52·3	31·6	14·8	58·5	52·0	·389	4·4	1·1	80	532	108·5	44·8	0·4	3	10	11	7	1·9	3·2	47
Allenheads	—	75·0	37·0	38·0	62·9	48·0	33·6	14·9	53·9	—	—	—	—	—	—	106·6	45·4	1·1	4	7	10	10	—	6·1	49
Silloth	29·584	79·8	38·9	40·9	69·5	51·2	35·5	18·1	58·7	52·4	·394	4·4	1·1	80	534	101·9	47·5	1·3	2	10	5	13	6·2	5·5	50
Carlisle	29·616	78·3	37·3	41·0	67·6	49·5	38·3	18·1	57·8	50·3	·367	4·1	1·3	77	534	98·8	45·0	1·8	5	7	5	13	6·4	6·3	53
Bywell	29·569	78·0	43·0	35·0	66·9	53·6	30·3	13·3	58·4	51·3	·378	4·3	1·2	78	533	91·2	47·8	1·2	4	11	5	11	—	4·5	55
North Shields	—	72·3	41·8	30·5	62·1	52·0	28·3	10·1	56·2	50·3	·365	4·1	0·9	82	536	—	51·0	1·5	10	7	4	10	—	5·8	47
Milltown (Ireland)	—	74·0	37·0	37·0	65·3	50·3	32·7	15·0	57·6	50·3	·367	4·1	1·0	78	531	—	45·5	1·8	7	6	9	8	—	4·6	46

The highest temperatures of the air were at Cambridge, 88°; and Nottingham, 87°.
The lowest temperatures of the air were at Allenheads and Milltown, 37°; and Streatley and Carlisle, 37°·3.
The greatest daily ranges of the temperatures of the air were at Salisbury, 23°; and Gloucester, 21°·9.
The least daily ranges of the temperatures of the air were at Guernsey, 9°·2; and North Shields, 10°·1.
The greatest numbers of rainy days were at Eccles, 56; and Bywell, 55.
The least numbers of rainy days were at Brighton, 31; and at Osborne and Salisbury, 35.
The heaviest falls of rain were at Stonyhurst, 15·33 inches; and Eccles, 15·18 inches.
The least falls of rain were at Osborne, 5·71 inches; and Brighton, 5·86 inches.

Quarterly Meteorological Table for different Parallels of Latitude.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind: Mean Estimated Strength.	Wind: Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain: Mean Number of Days it fell.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°								
Guernsey	29·593	76·5	49·5	27·0	65·5	56·3	22·0	9·2	59·1	55·8	·444	4·9	0·7	89	531	—	—	1·1	8	7	7	9	3·6	4·4	43
Between the latitudes 50° and 51°	29·591	81·2	43·2	38·0	69·5	54·2	34·1	15·3	60·4	54·1	·420	4·7	1·2	80	531	98·7	52·1	1·8	8	7	7	9	—	5·5	42
51° and 52°	29·601	84·0	41·3	42·7	70·6	52·5	38·2	18·2	60·3	53·8	·415	4·6	1·2	79	530	115·3	48·6	1·0	6	7	7	11	2·8	5·9	42
52° and 53°	29·581	84·0	42·3	41·7	70·1	52·5	38·6	17·6	60·0	54·4	·424	4·7	1·1	82	532	114·6	48·6	1·0	7	7	7	10	3·1	6·2	39
53° and 54°	29·615	80·6	42·1	38·5	67·3	51·6	34·2	15·7	58·3	51·6	·383	4·3	1·1	79	530	98·9	45·2	0·8	6	8	5	11	2·8	6·5	50
54° and 55°	29·588	77·9	39·2	38·7	66·8	50·9	34·5	15·9	57·5	51·5	·382	4·3	1·2	79	533	101·4	46·1	1·2	4	9	7	11	5·5	5·5	51
Mean for the Quarter, 50° to 55° Year 1872	29·489	85·2	34·3	50·9	68·9	52·2	41·4	16·7	59·3	52·7	·403	4·5	1·2	79	529	108·7	46·4	1·1	6	5	8	12	3·4	5·6	46
" 1873	29·536	87·5	36·6	50·9	67·9	51·3	37·5	16·6	58·4	51·9	·389	4·3	1·2	79	529	103·9	45·5	1·0	4	3	9	15	4·2	5·6	49
" 1874	29·527	85·3	40·2	45·1	69·3	51·6	36·7	17·7	59·2	52·0	·389	4·4	1·3	78	529	108·8	46·2	1·2	4	4	9	14	3·6	5·6	47
" 1875	29·595	81·5	41·6	39·9	68·9	52·3	35·9	16·6	59·3	53·1	·405	4·5	1·2	80	531	101·8	48·1	1·2	6	8	7	10	3·5	5·9	45